plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

IN THIS ISSUE

Composition of Cobalt-Nickel Films

A Simple Transistorized Thicknessmeter for Electroplates

Effect of Cleaning Methods Upon Electrochemical Behavior of High-Carbon Steel Cathodes in a Chromic Acid Electrolyte

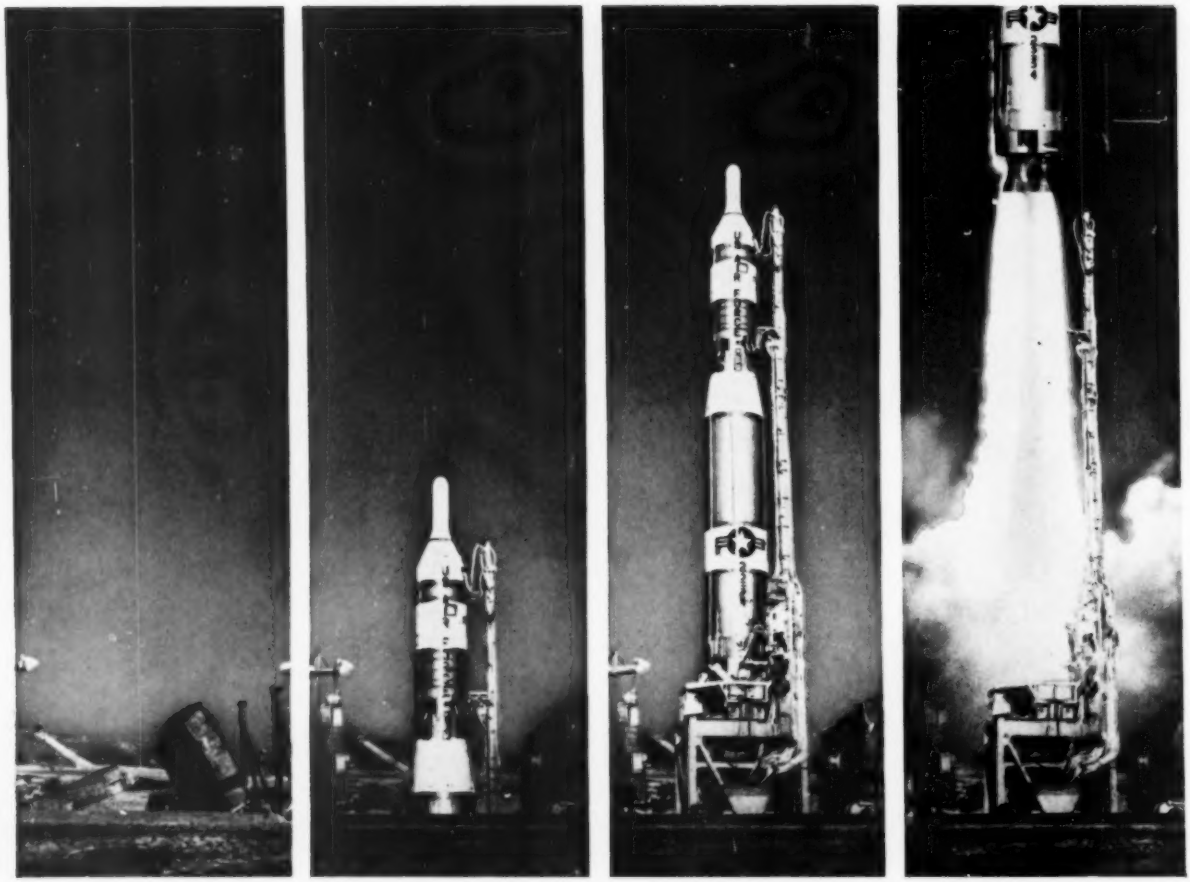
The Electrically Assisted Chemical Milling of Aluminum

PLATING MAGAZINE

AUDITED PAID CIRCULATION ABC

University Microfilms
313 N. First St.
Ann Arbor, Michigan

NOVEMBER 19



Squadrons of Air Force Intercontinental Ballistic Missiles nest underground in strategically placed concrete silos. As 200-ton doors swing open, the missile rises to lift-off position, is ready in seconds for launching.

AUTRONEX GOLD*-PLATED CIRCUITS HELP GUIDE ICBMs TO TARGET...A CONTINENT AWAY!

From lift-off to target, electronic circuits at the heart of every ballistic missile relay environmental conditions to ground controls. These, and similar components used in advanced ICBM telemetry systems, must perform in alternating extremes of temperature and pressure which "break" ordinary materials.

That's why manufacturers of missile circuitry, such as Radiation, Inc., Melbourne, Florida, use the patented Autronex Acid Gold Plating Process to coat vital electronic components. According to Radiation, Inc. Engineers, Autronex Gold Plated printed circuits have improved reliability, and easily pass rigid mil/specs calling for hard, bright gold alloy coatings 100-150 millionths thick covering all circuit conductors.

At Radiation, Inc., the Autronex Acid Gold is applied in the unique Sel-Rex JET PLATER—the complete precious metal plating facility in a single compact cabinet. Originally purchased for plating circuits, the versatile JET PLATER is also used to plate R & D antennas and microwave components.

Sel-Rex makes the world's largest selection of processes which take the guess work out of plating precious metals. Baths are simple to prepare and easy to maintain through the use of scientifically-precise, pre-measured salts and solutions. Your assurance of consistent quality results from one work-load to the next.

An internationally based network of sales and service technicians is at your disposal to make sure you get the optimum results built into every Sel-Rex Process. Complete technical literature on request. Specify precious metal(s) and your application.

Sel-Rex Jet Plater at Radiation, Inc.

SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

The World's Largest Selling Precious Metal Plating Processes

*Patented

NEW 'ENPLATE' chemical plating baths plate without electric current

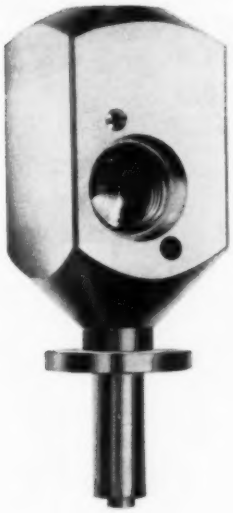


PLATE HARD NICKEL
OF UNIFORM THICKNESS ALL OVER

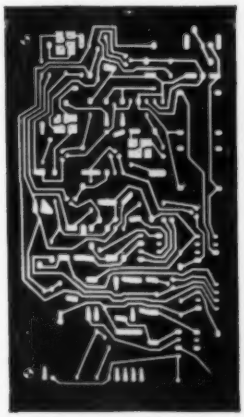


PLATE COPPER ON PRINTED
CIRCUITS, PLASTICS, CERAMICS, METALS

COMPLETE 'ENPLATE' PROCESSES AVAILABLE FOR PLATING ON MORE THAN 50 MATERIALS— FROM ALUMINUM TO VINYL

Plastics, printed circuits, rubber, glass, ceramics, ferrites, other non-conductors and semi-conductors, metals. These are among more than 50 materials you can now plate efficiently at low cost with Enthone's new line of 'Enplate' electroless nickel, copper and silver plating products and processes.

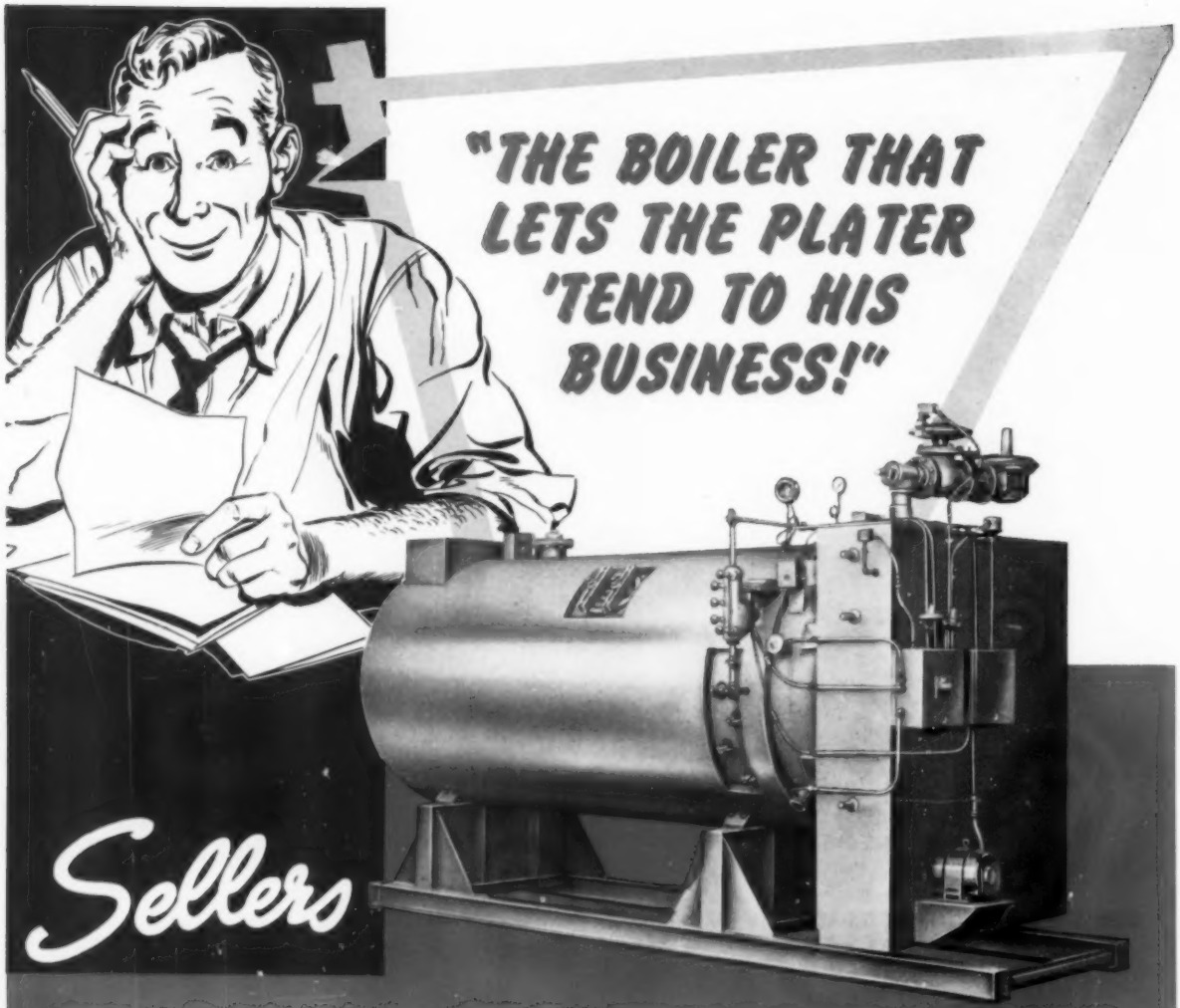
For example, 'Enplate' Ni-410 deposits a hard, wear-resistant, nickel-phosphorous coating of uniform thickness on the most complex parts. Corrosion resistance is better than electroplated nickel. Brass housing illustrated above has same thickness of 'Enplate' nickel in blind holes and screw threads as on outer surfaces and edges. 'Enplate' CU-400 is excellent for rapid application of a thin film of copper on non-conductor surfaces. Plastic surfaces, such as thru-holes in printed circuit board shown, can be made conductive for subsquent electro-plating.

'Enplate' chemical plating baths are highly purified, ready-to-use liquid concentrates. Just add to water to make instantly usable chemical plating solutions. For guidance on your best chemical plating cycle and on proper cleaning and activation procedures, write today for your copy of the new 'Enplate' brochure. Enthone Incorporated, 442 Elm Street, New Haven 8, Conn.

ANOTHER PRODUCT OF *Enthone* RESEARCH

ENTHONE *A Subsidiary of American Smelting and Refining Company* ASARCO

CHEMICAL PLATING



"THE BOILER THAT LETS THE PLATER 'TEND TO HIS BUSINESS!"

Sellers

THE TROUBLE-FREE IMMERSION BOILER

- No open flame
- Simple design
- Positive pressure blower overcomes building vacuum and chimney back draft
- Easy accessibility
- Self-cleaning tubes
- No foul fumes
- Safe, complete combustion
- Low cost maintenance
- No scale problem
- Maximum heat transfer

Write for Bulletin 5209-A

Sellers ENGINEERING COMPANY

4876 North Clark Street • Chicago 40, Illinois

FOUNDED 1909

An Educational Society for the Advancement of Electroplating, Metal Finishing and Allied Arts

John P. Nichols
Chairman, Editorial Board and Managing Editor

Rodney Leeds
Editor

Joseph M. Andrus — **George J. Marotta**
Dr. Henry Brown — **Dr. F. A. Lowenheim**
Robert F. Howard — **Dr. Jos. V. Petrocelli**
Dr. Henry L. Kellner — **Harold W. Scott**
Gerald A. Lux — **Dr. Edw. B. Saubestre**
Editorial Board

Sarah A. Ryan
Editorial Assistant

Thomas W. Lowe
Production Manager

Kathleen F. Duquette
Circulation Manager

Mary Lou Dowdell
Subscriptions & Books

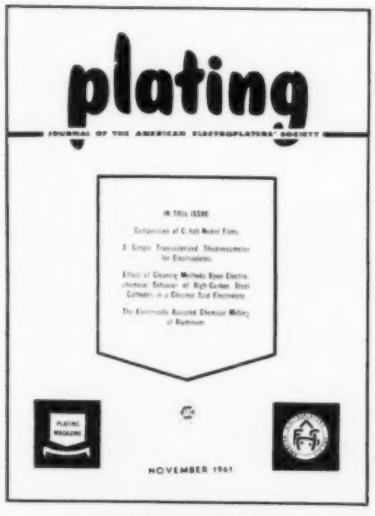
Kathryn H. Langan
Billing & Accounting

Dorothy R. Rudy
Readers Service

S. W. Freestone
Advertising Manager

Loretta B. Ehrhardt
Advertising Assistant

Wettstein, Nowell & Johnson, Inc.
Western Advertising Representatives
Los Angeles 57
672 S. Lafayette Park Place
Phone: DUnkirk 8-2286
San Francisco 5
417 Market Street
Phone: YUkon 2-9537
Portland 5
921 SW Washington Street
Phone: CApitol 8-4107

SOCIETY of BUSINESS MAGAZINE EDITORS

Cover by James A. Civille

plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

NOVEMBER 1961 — **Vol. 48, No. 11**

EDITORIAL

The Spirit of AES 1177
by Edward E. Oberland

Composition of Cobalt-Nickel Films 1207
by Ignatius Tsu

A Simple Transistorized Thicknessmeter for Electroplates 1211
by U. H. Narayanan and K. R. Venkatachalam

Effect of Cleaning Methods Upon Electrochemical Behavior of High-Carbon Steel Cathodes in a Chromic Acid Electrolyte .. 1213
by George Chaplenko

The Electrically Assisted Chemical Milling of Aluminum 1221
by John E. Spessard

ASTM, Committee B-8 Semi-Annual Meeting Summary 1223
by Dr. Edward B. Saubestre

AES Directory	1273	Future Meetings	1272
AES Membership Report	1271	Industry News	1238
AES News	1225	Industry News Briefs	1244
Article References	1198	Index to Advertisers	1274
Books	1237	Intersociety News	1236
Branch News	1258	Patent Abstracts	1245
Classified Advertisements	1271	Personals	1255
Equipment and Supplies	1250	Trade Literature	1248

Published by American Electroplaters' Society, Inc. (AES), American Building, 443-445 Broad Street, Newark 2, New Jersey. Phone HUmboldt 2-3400.

Copyright 1961, American Electroplaters' Society, Inc. Published monthly at 5800 N. Marvine Street, Philadelphia 41, Pennsylvania. Second class postage paid at Philadelphia, Pennsylvania. Executive, Editorial and Advertising Office, 443-445 Broad Street, Newark 2, New Jersey.

Articles appearing in this publication may not be reproduced in full or in part without express permission of the Managing Editor. Statements of fact and opinion given in articles and papers in PLATING MAGAZINE are those of the contributors. Neither PLATING nor its parent, American Electroplaters' Society, assumes responsibility for them. All acknowledgments and references in articles are the responsibility of authors. PLATING shall not be expected to investigate any process described in any author's article to ascertain whether or not covered by an existing patent.

Yearly subscription for AES members is $2.00; AES non-members USA and Canada, $5.00; foreign, $8.00. Single copies domestic, 65¢ a copy; foreign, $1.00 a copy. AES non-member back issues, six months or older, $1.00 a copy (Golden Jubilee Issue and 50th Anniversary Issue, each $2.00 a copy).

Change of address should reach us by the 15th of the month preceding issue with which it is to go into effect. In sending us your change of address, kindly send old address as well as new one.

PLATING MAGAZINE is indexed in Applied Science and Technology Index and is abstracted regularly in Chemical Abstracts, Metals Review, Metal Working Review, Metallurgical Abstracts, Engineering Index, Technical Data Digest, Bulletin Analytique and others.

HARSHAW
CYNOREX

BRIGHT COPPER PLATING PROCESS

The only copper bath with these 3 features

1

SIMPLE* OPERATION

Cynorex is the only copper bath with just one non-metallic addition agent. You'll have no juggling of two or three brighteners.

*See Webster's Definition

2

NO CHROME CONTAMINATION PROBLEM

Cynorex is self-purifying.

3

CARBON FILTRATION WITHOUT ADDITION AGENT LOSS

Cynorex can be continuously circulated thru carbon.

HARSHAW

There are more features we'd like to explain to you...

contact us at any of the offices listed below.

THE HARSHAW CHEMICAL COMPANY

1945 EAST 97th STREET • CLEVELAND 6, OHIO

CHICAGO 32, ILLINOIS • CINCINNATI 13, OHIO • CLEVELAND 6, OHIO • DETROIT 28, MICHIGAN • HASTINGS-ON-HUDSON 6, N.Y. • HOUSTON 11, TEXAS • LOS ANGELES 22, CALIF. • PHILADELPHIA 48, PA. • PITTSBURGH 22, PA.

Plating Processes also available through the following Foreign Distributors or Manufacturers:

HARSHAW CHEMICALS LTD., LONDON, ENGLAND
ARMALITE CO. LTD., TORONTO, CANADA
L. VAN DER HOORN, UTRECHT, HOLLAND
ROBERT BRYCE & CO. LTD., MELBOURNE, AUSTRALIA

And many Agents throughout the world

EDITORIAL

THE SPIRIT OF AES

WHAT IS THE MEASURE of an organization? In the case of American Electroplaters' Society, Inc. (AES), is it the number of its members? The circulation and quality of its PLATING MAGAZINE? The attainments of its Research Program? The size of its Conventions? Obviously, it is no single one of these, although each, of course, contributes to form the composite surface image.

Beyond surface, however, the measure of our organization rests sizably upon an intangible which can best be labelled as "AES Spirit." It can well, I believe, be considered unique—an asset of which all dedicated AES members and officers can well take pride.

The dedication of AES members—the hard work for AES of so many of them—the willingness of AES's rank and file to share knowledge—the business and intellectual attainments of so many AES members through the years—these and other such considerations have substantially inspired and prodded the Society to achieve its present international prestige for educational worth. And, by the way, it is not to be inferred that all this dedication and hard work is necessarily altruistic. Undoubtedly much of it stems from the practical realization of so many AES members that the more effort one puts into such an activity, the more knowledge and self-improvement one is likely to gain.

Now what about AES's future—what about its continuing progress?

Recognizing the need to be apace of the times, and to fortify for the challenge of the future, the Society, at its recent Annual Meeting in Boston, decided to establish a Constitutional and Bylaw Revision Committee to create a modern instrument streamlining AES governmental structure and AES law for consideration, if possible, by the next Annual Meeting of the Supreme Society, AES's summit governing council. An appointed Committee, manned by well-respected and qualified men, is now at work on that significant project.

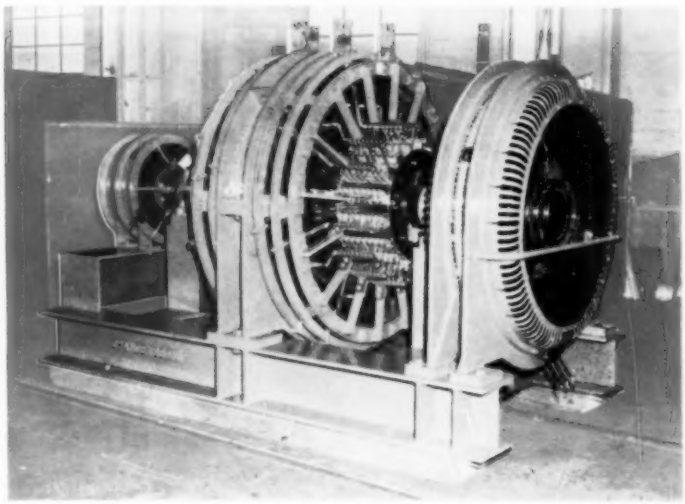
It is hoped and urged that when the time comes to consider and to pass upon that resultant proposed instrument, all of us will lay aside subjective considerations for objective ones, and act for the best long-range interest of the Society—and for the maximum long-range good of the AES majority. That hope is left with confidence to the "Spirit of AES."

Edward E. Oberland

Third Vice President
American Electroplaters' Society, Inc.

Chandeysson has been commissioned by the Electric Auto-Lite Company to remanufacture and sell the Chandeysson motor generator sets used in its modern bumper plant, now closed.

- EACH UNIT HAS BEEN FACTORY REMANUFACTURED . . . BACKED BY A NEW EQUIPMENT GUARANTEE
- LATEST DESIGN . . . ALL UNITS MANUFACTURED IN MID 1950's



ONE-DAY AUCTION - NOV. 30, 1961

ALL UNITS TO BE AUCTIONED AT THE CHANDEYSSON PLANT, ST. LOUIS

- 300,000 TOTAL AMPERES . . . VOLTAGES FROM 6 TO 48
- APPROXIMATELY 40 SETS WILL BE SOLD

REPRESENTATIVE LIST OF EQUIPMENT TO BE SOLD

Several 10,000 amperes, 24/48 volts
Several 7,500 amperes, 24/48 volts
Several 10,000 amperes at 20, 18, 15, 12 volts
Several 12,500 amperes, 15/30 and 12/24 volts
Several 10,000 amperes, 12/24 volts
Many smaller sets at various current and voltage ratings

COMPLETE DETAILS WILL BE GIVEN ON REQUEST

TIME:
November 30, 1961 — 10:00 a.m. (CST)

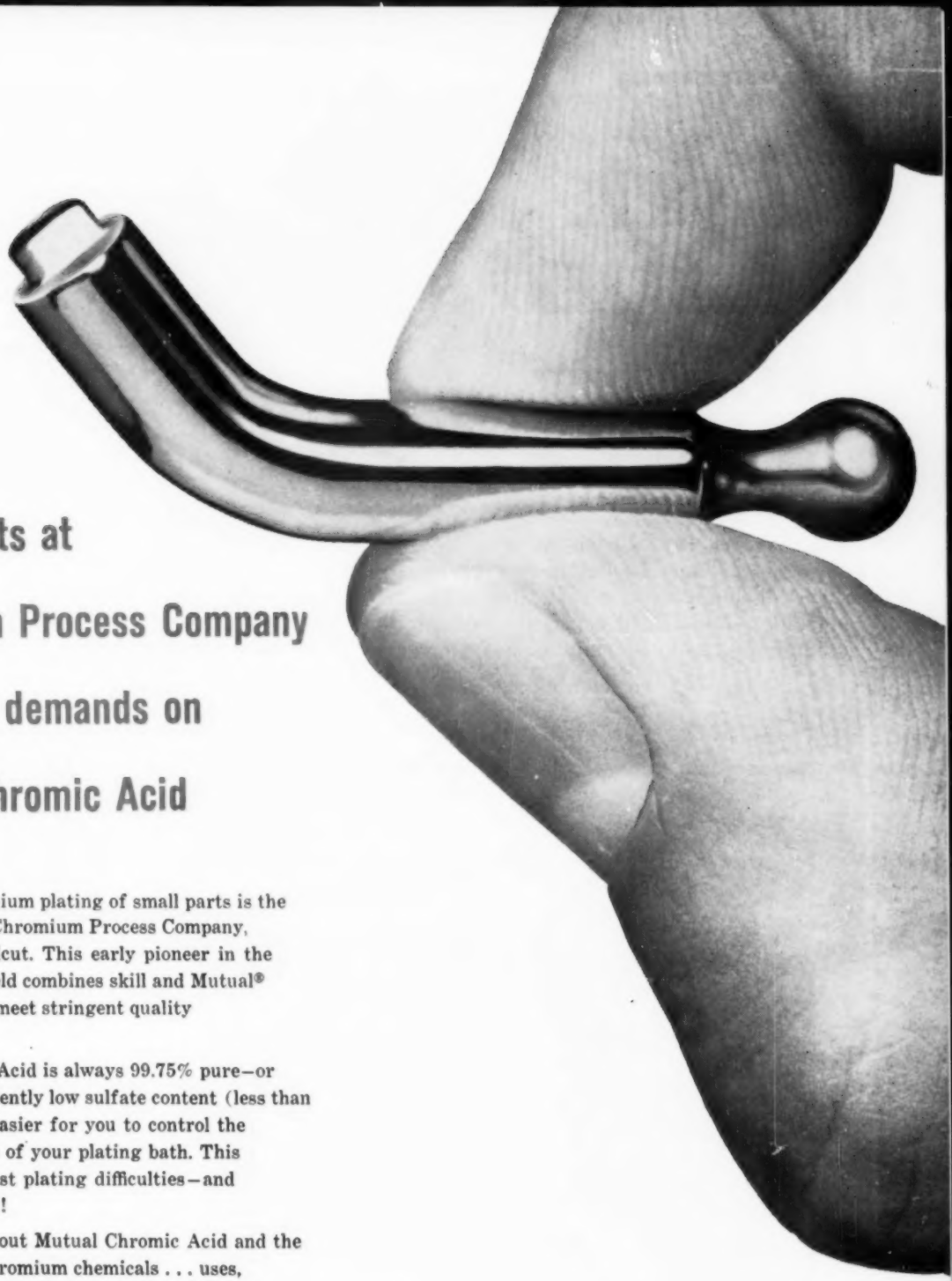
PLACE:
Chandeysson Electric Company plant

TERMS:
Full settlement within 10 days

We'll be happy to arrange hotel or motel reservations for you. Just call us COLLECT at HU 1-1400 (direct distance dial 314) and tell us the type of accommodations you desire.

Chandeysson

4084 BINGHAM AVENUE
ST. LOUIS 16, MISSOURI



Small parts at Chromium Process Company make big demands on Mutual Chromic Acid

Decorative chromium plating of small parts is the specialty of The Chromium Process Company, Shelton, Connecticut. This early pioneer in the custom plating field combines skill and Mutual® Chromic Acid to meet stringent quality requirements.

Mutual Chromic Acid is always 99.75% pure—or better. Its consistently low sulfate content (less than 0.1%) makes it easier for you to control the acid-sulfate ratio of your plating bath. This safeguards against plating difficulties—and expensive rejects!

To learn more about Mutual Chromic Acid and the Mutual line of chromium chemicals . . . uses, properties and comprehensive technical data . . . write for your free copy of Solvay's 80-page Technical Bulletin, "Chromium Chemicals." Our Technical Service Staff will also be happy to answer your questions. State whether you would like to have a representative call.

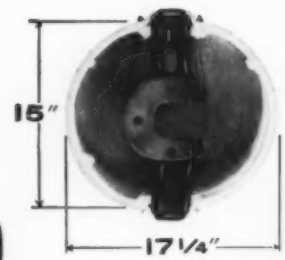
SOLVAY® PRODUCTS FOR PLATERS

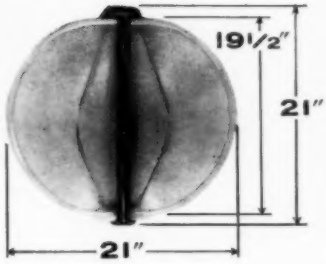
Mutual Chromic Acid • Solvay Caustic Soda • Solvay Hydrogen Peroxide • Solvay Methylene Chloride • Mutual Sodium Chromate • Mutual Sodium Bichromate • Solvay Soda Ash

Allied Chemical

SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N.Y.

STUTZ *EXCLUSIVE* OVAL-SHAPED BARREL

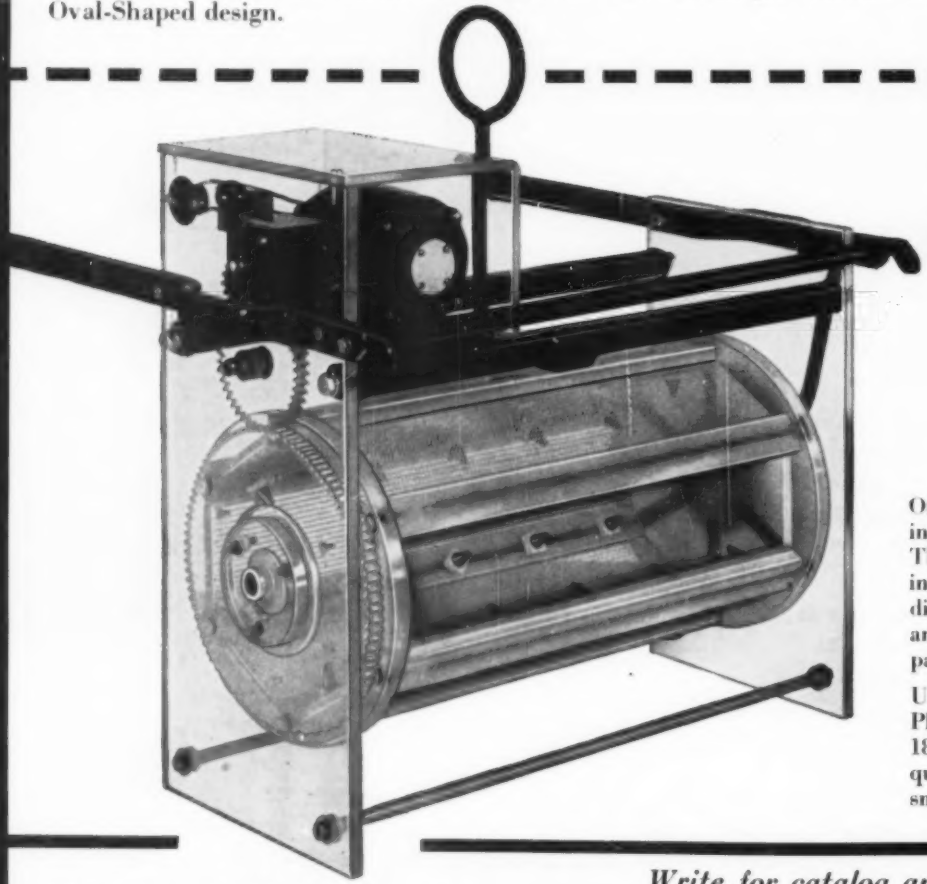




Stutz, the leader in Barrel Plating Equipment, presents an entirely new *Oval-Shaped Barrel* for use on Tub Type automatic barrel plating machines.

The Stutz Barrel, constructed of virtually indestructible *Polypropylene*, or *Linear Polyethylene* material, has a unique Oval-Shaped Top and a Convex Bottom. This design produces more convenient loading and unloading, greater load capacities and resulting increased production. The special design reduces dragout to a minimum as compared to previous obsolete designs.

Every user of this new barrel will vouch for the advantages received from this unique Oval-Shaped design.



PORTABLE Plating Barrel *with* CONE BUTTON CONTACTS

Offered for the first time, a Portable Plating Barrel with Cone Button Contacts. This type contact produces a perfect plating job on small delicate parts without distorting the parts. Barrel is of loose rib and panel design for easy replacement of parts, when necessary.

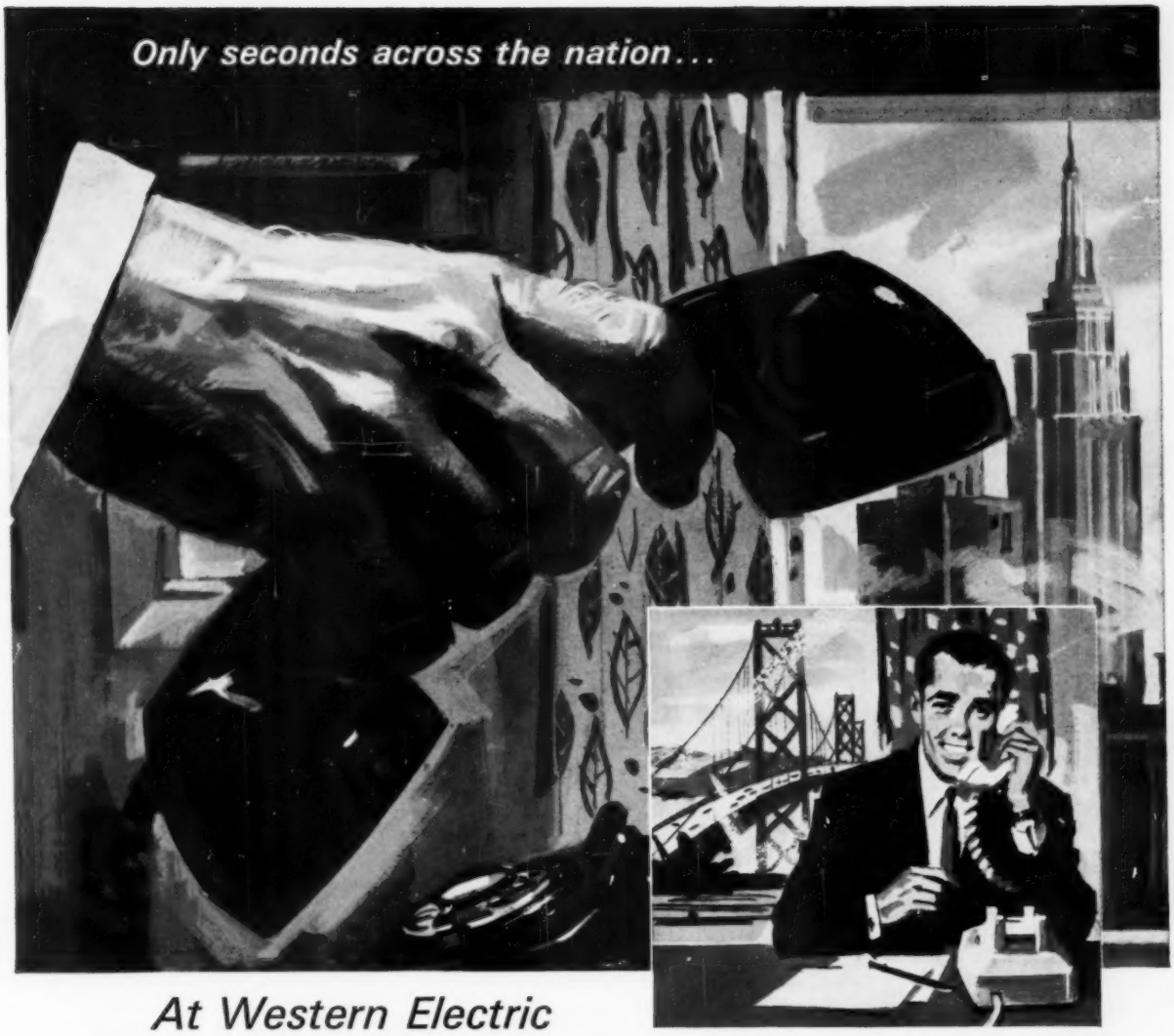
Units available in high temperature Plexiglas in either 6″ x 12″ I.D. or 8″ x 18″ I.D. sizes. Also special sizes upon request. Standard perforations are 3/32″, smaller or larger openings are available.

Write for catalog and Prices.

The STUTZ Company

4420 West Carroll Ave., Chicago 24, Ill.

Serving Industry Over 40 Years



At Western Electric

MEAKER AUTOMATIC DELIVERS CONSISTENT QUALITY ZINC PLATING FOR MILLIONS OF SWITCH PARTS

How large the world? No more than the minutes it takes to telephone *anywhere!* A pioneer in communications is the Western Electric Company which builds years of rugged service into every piece of telephone equipment produced at its extensive Hawthorn Works, Chicago. Superior performance is a never-ending quest of Western Electric production engineers.

The Meaker "Automatic" was chosen and installed four years ago to zinc plate switch mounting plates and relay covers. These are parts of busy telephone central offices—the communication nerve centers of offices and factories throughout the United States.

Since 1899, Meaker engineers have been building automatic metal processing equipment. These range from units tailor-made to fit limited floor space and handle modest output to the largest plating installation in the world!

Whether large or small, every Meaker is made to save its owner money—through lower labor costs, greater plating uniformity and greatly improved product quality. Send for our new catalog "When to Automate" which will give you some valuable ideas on improving your profits—and products—through automatic plating or metal finishing.

SINCE MEAKER 1899

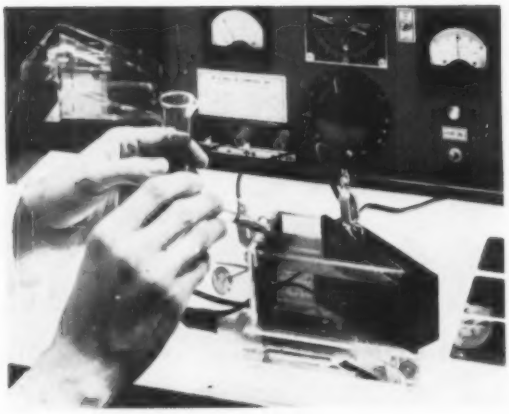
THE MEAKER COMPANY

SUBSIDIARY OF SEL-REX CORPORATION

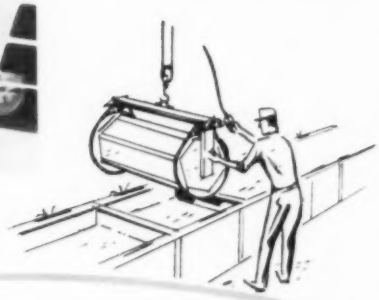
Nutley 10, New Jersey

Factories and offices Chicago 50, Ill., Los Angeles, Cal. and Nutley 10, N. J.

New ROHCO-OPTIMIZED *Process*



for Finest Barrel-Plating in Zinc... at Low Cost!



"ECONOBRITE 117"

Features Bath Solubility and Stability • Good Quality Deposits • Greater Throwing Power • Brighter Finish

"Econobrite 117" offers you a balanced combination of qualities of premium-type processes concentrated in a single, one-shot brightener at low cost. It adds improved characteristics of solubility for speedier bath preparation, as well as bath stability and greater tolerance factors for wider variations of temperature, contamination, concentration, etc. Surpasses most commercial brighteners for brightness, throwing power and other process advantages. An all-over better zinc plate results without further bath attention or "boosting"—no need for excessive usage. ROHCO-Optimized "Econobrite 117" means finer quality zinc plating for your barrel lines both manual and automatic. Contact your ROHCO Distributor, or ROHCO Main Office. Ask for FREE Manual.

Nationwide Stockpoints

ROHCO

R. O. HULL & COMPANY, Inc.

1310 Parsons Court • Rocky River 16, Ohio

"The right start . . . a better finish"

CADMIUM PLATING PRODUCTS

ROHCO 20 XL and Super XL: World's leading cadmium brighteners.

ROHCO Cad-Sol: Add water for instant cadmium plating bath.

ZINC PLATING PRODUCTS

ROHCO 100 and ROHCO 102: Barrel zinc brighteners for brilliant, blue-white deposits.

Econobrite: Economical, bright deposits, suitable for post-plating dip.

Perma-Brites: Uniform, commercial finishes at lowest cost.

ROHCO 503: Most popular zinc brightener in plating.

ROHCO Zinc Purifier: Purges zinc plating baths — saves brightener.

ROHCO Zinc Sol: Add water for instant zinc plating bath.

ROHCO ZW-600: Wetting agent for more efficient, cleaner zinc plating.

CONVERSION COATINGS

Rodips CD-3, CD-4, CZ-10, and Roblack for cadmium: Superior post-plating treatments for passivating and coloring cadmium plate.

Rodips ZN-22, ZN-23, ZN-25, ZN-30, etc., for zinc: Superior post-plating treatments for passivating and coloring zinc plate.

Rodip AL-50 for aluminum: Superior chromate treatment imparts corrosion protection to aluminum and its alloys.

OTHER ROHCO PRODUCTS

ROHCO Super No-Cro-Mist and ROHCO Anti-Spray: Spray suppressants for chromium plating baths.

ROHCO Rins-Aid: Water shedder; improves drying, prevents staining.

Rodip AL-44: Improves aluminum brite dips.

Hull Cells, Rectifiers and Related Plating Test Equipment: Wide range of models for every purpose and convenience.

This is the house that **BETTER CLEANERS BUILT!**

Northwest Chemical Company was founded with the express idea of supplying BETTER cleaners to the trade. Today, thanks to a steadfast adherence to the policy of top quality ingredients carefully blended with mature experience and pleasingly flavored with good service, Northwest has attained a position of respected leadership in the cleaner field.

A cleaner is only as good as the house behind it. Today's fast changing materials and methods quickly obsolete yesterday's products, constantly creating a need for completely new types of cleaners.

Northwest's continuing research program offers our customers the BEST advanced thinking, no matter what the problem. You are paying for Northwest's plus values wherever you buy. Why not avail yourself of them?

Licensed Manufacturers

Alert Supply Co.,
Los Angeles, California

●

Armalite Company, Ltd.,
Toronto, Canada

NORTHWEST CHEMICAL COMPANY

9310 ROSELAWN • DETROIT 4, MICHIGAN

CHEMICAL PRODUCTS DIVISION • CHEMETRON CORPORATION

For top efficiency in tank cleaning

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS

First choice in heavy-duty tank cleaning —hard-working Oakite "24"

Users everywhere agree that their best way to clean iron and steel parts is to tank-soak them in a hot solution of heavy-duty Oakite 24. This hard-working alkaline cleaner gets under the dirt layers and literally tears the soil from the surface. Despite excessive soil contamination of solution Oakite 24 maintains proper pH level and provides long, effective cleaning action.

Oakite 24 is but one of a wide range of alkaline tank-cleaning compounds. Others include medium and light duty oil and grease removers; self-emulsifying solvent cleaners specially designed for removing buffing compound residues, pigmented drawing compounds and other tenacious burned-on solid-particle dirts and smuts. Also available is a useful selection of materials for cleaning brass, copper, aluminum, magnesium, lead, tin and zinc.

Which is best for you? Only you and the Oakite man together can decide. It depends on your equipment, the parts you process, the next production step. Ask the Oakite man. From over 30 materials, you're *sure* to get the one cleaner that works most efficiently for you. Write for Bulletins. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

SCIENCE

over 50 *Est. 1909*

years' leadership in industrial cleaning

91%*

THE percentage of aggregate PAID subscription renewals of PLATING MAGAZINE for the twelve-month renewal period covered by its Publisher's Statement of June 30, 1961, latest available, was an astronomic 91%.*

It means, of course, that 91% of those who invested in an annual PLATING MAGAZINE subscription, whether members or non-members of American Electroplaters' Society, Inc. (PLATING's parent), demonstrated the value to them of that investment by paying for renewal of their subscriptions expiring during that stated period.

As for consistency, it is worth noting that the percentage of aggregate PAID subscription renewals of expired PAID subscriptions of PLATING MAGAZINE for the full twelve-month renewal period covered by its ABC Audit Report of December 31, 1960 (latest available) was also an astronomic 91%.* It was 88% for the twelve-month renewal period covered by its Audit Report of December 31, 1959.

What kind of extra advertising mileage can YOU the Advertiser earn in the fertile electroplating and metal finishing market from steady, effective advertising in the monthly magazine that not only serves the largest audited PAID international circulation in this market but which also has a 91% aggregate PAID subscription renewal record to demonstrate the value and appeal of its exacting standards of technical and general article coverage to the bulk of its readership?

Over 200 Advertisers are answering that question by the fact of their PLATING MAGAZINE advertising. If YOUR company or YOUR client company is not now among them aggressively bidding for sales recovery after that recent recessional storm, ready it for TPT ("Try PLATING Test") by having us send you, without obligation, a copy of PLATING's current "Market Data and Media File", just released.

PLATING MAGAZINE

AMERICAN BUILDING • 443-445 BROAD STREET • NEWARK 2, N. J.
Telephone: HUmboldt 2-3400

*Aggregate percentage based on publisher's consolidation of renewal percentage data reported in 1) ABC Publisher's Statement of June 30, 1961 [Subscriptions other than Association and Bulk 78.82% (897 renewals of 1138 expirations); Association 93.41% (6961 of 7452); Bulk 87.23% (560 of 642)] and 2) ABC Audit Report of December 31, 1960 [Subscriptions other than Association and Bulk 83.05% (867 renewals of 1044 expirations); Association 92.85% (6424 of 6919); Bulk 85.10% (577 of 678)].

Looking For Savings? Then Read . . .

Lockheed F-104A Starfighter with aluminum surfaces protected by Iridite 14-2.

How IRIDITE® Helps Lockheed Cut Aluminum Finishing Costs

Nine years ago, Lockheed switched from anodizing to Iridite chromate conversion coatings. That year, they saved over $40,000 in materials and manpower.

Today, Lockheed is still saving money with Iridite 14–2. Here's how:

Process time is reduced from 45 minutes to a maximum of only 5 minutes. Three times as much work is processed in a single run. Easy-to-load baskets, replacing costly anodizing racks, save $15,000 per year. Expensive electrical equipment is eliminated because Iridite is a simple chemical dip.

Moreover, Iridite 14–2 gives improved corrosion resistance, easily meeting MIL–C–5541, and provides excellent paint adhesion.

More than likely, Iridite can save you money and give you better finishing results than your present method. Discuss it with your Allied Field Representative. Or, write for literature.

Allied Research Products, Inc. 4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co. • European Agent: Sture Gronberger, Storgatan 10, Stockholm, Sweden

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

METALWORKING IS No. 1 IN FLORIDA'S INDUSTRIAL EXPANSION

● In only 5 years, 1096 metalworking plants have moved to or expanded in Florida's Better Business Climate . . . the best under the sun. Employment has grown from 23,900 to 48,600.

FIVE STAR REASONS WHY:

- Florida manufacturers of industrial items and consumer products need metalworking. The need is growing daily.
- Florida taxes are lower. *No state, corporation or personal income taxes.* Your inquiry will be answered with an outline of the complete tax structure.
- Plant building costs are lower in Florida. One Tampa Bay electronics manufacturer built for 50 per cent less than in the north. Air conditioned, too! Operating costs are lower in Florida.
- Ample personnel is available. High calibre technicians, skilled and semi-skilled production employees.
- Profits are higher in Florida. ⅓ more is not unusual.

FLORIDA'S ASSURANCE POLICY

"You have my personal assurance of a sunny business climate here in Florida. You have positive assurance of every aid and assistance possible from our Florida Development Commission and from the overwhelming majority of our businessmen, industrialists, and financiers. We have everything to make your large or small enterprise healthy and successful. Write, wire or phone us TODAY. The only thing better than a FLORIDA vacation is having your plant here."

Farris Bryant

Governor, State of Florida

Investigate DEBT-FREE

Florida

...A 10 BILLION DOLLAR MARKET

Ask about free film "Profile of Progress."

Mr. Wendell Jarrard, Chairman
Florida Development Commission
Box 4126B, Tallahassee, Florida

Please send me "Plant Location Guide" containing all the facts about Florida's opportunities for New Industry, the 10 BILLION DOLLAR CONSUMER MARKET, Labor, Climate, Schools, Natural Resources, Favorable Tax Structure.

Name .....

Firm Name .....

Address .....

City ..... Zone ..... State .....

FLORIDA FOR CONVENTIONS — Write for free information on Florida's wonderful facilities for your group meeting.

ALLIED RESEARCH
COMPACT RECTIFIERS
3000 amperes—12 volts each
Size: 34" x 34" x 46"
Total height: 114"
Available with conventional or automatic controls

FOR SALE:

Full performance in a compact size rectifier

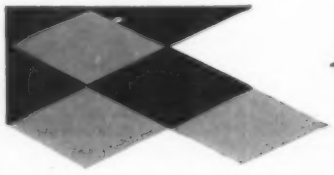
1000, 3000, 12,000, 20,000—whatever the amperage you need, you save valuable floor space and money by using Allied's Compact Silicon Rectifiers.

What's missing from Allied's Compacts? Nothing but expensive hot air. What's in it for you? Extra diodes, plenty of copper and big, rugged transformers to give full-size performance . . . all in a smaller cabinet to save you money.

But, this isn't the full value story. We know that when a rectifier stops, so do your profits. So, we've also included a new, efficient cooling system and exclusive protective devices to cut downtime and increase rectifier life.

You can build your own capacity with Allied Compacts. Use any combination of 1000 to 3000 ampere building block units side by side or stacked up to meet present or future needs.

Get full details on Allied Compact Rectifiers from your Allied representative today. He's listed in the Yellow Pages under "Plating Supplies". Or, write direct.



Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND

Affiliated operations in principal countries

NICKEL PENTRATE®

First in the Black Finishing Field

You just can't beat Nickel Pentrate when it comes to black finishing. It's way out in front on all points: (1) faster, more uniform blackening, (2) increased corrosion resistance, (3) increased abrasion resistance, (4) improved appearance and (5) lower operating costs. If you are not fully acquainted with Nickel Pentrate and what it can do for your product or your business, write for illustrated bulletin which gives detailed information.

HEATBATH CORPORATION
SPRINGFIELD 1, MASSACHUSETTS
or 701 North Sangamon St., Chicago 22, Ill.

39 Years of Service to the Heating Treating and Metal Finishing Industry

DAW JUNIOR

FULLY AUTOMATIC PLATING MACHINE

(Furnished For Rack Or Finger Type Plating)

Unloads Automatically Only plating machine in the industry that unloads racks or fingers without operator's attention.

Selective Cycling Automatic by-passing of tanks—or any combination of cycles—can be arranged on the Daw Jr.

Minimum Dragout Cam lift, between tank transfers, tilts work above horizontal which practically eliminates dragout regardless of workpiece shape or size.

Machine Modifies Easily Quick removal or addition of tank-and-carrier sections shortens or lengthens machine to suit any need.

Installs Anywhere Daw Junior fits in any unusual or limited floor space, and where headroom is lowest.

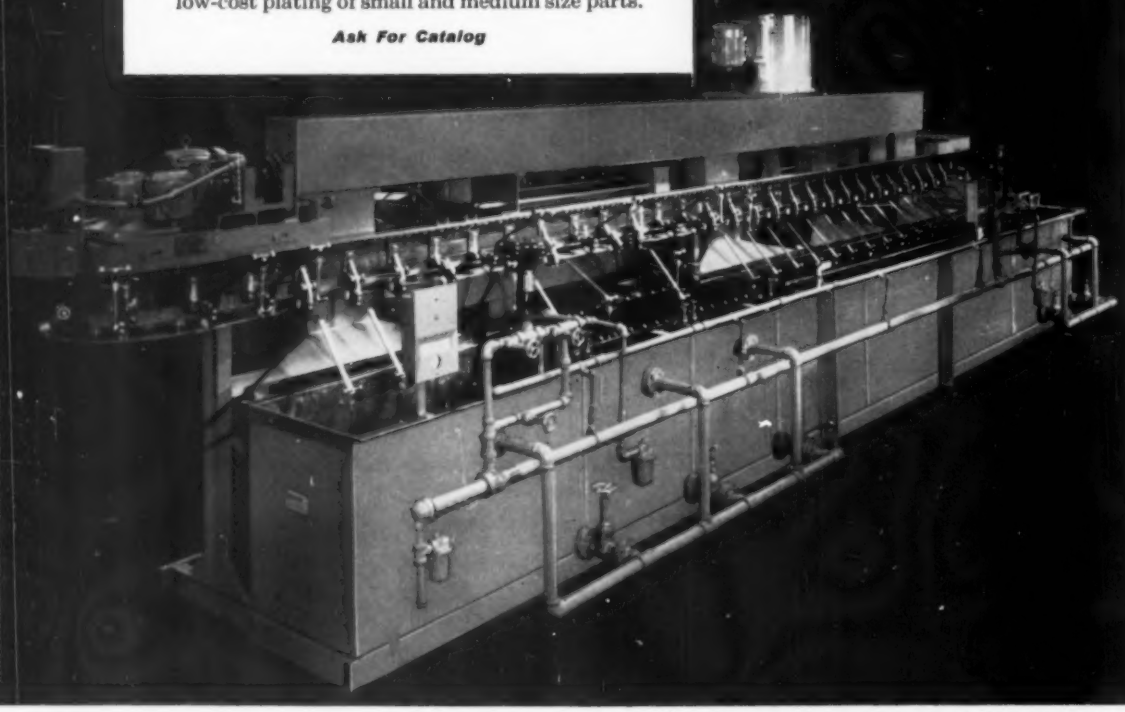
Fast And Economical The most versatile, most efficient machine ever designed for fast, low-cost plating of small and medium size parts.

Ask For Catalog

AUTOMATIC UNLOADING

★

AUTOMATIC CYCLE SELECTION



LASALCO, INC.

HOME OFFICE: 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
IN TEXAS: 2805 Allen St. • Dallas, Texas • Riverside 7-8093

ATTACH TO COMPANY LETTERHEAD

Send complete information on Daw Jr. Automatic Plating Machine

Name.....

Title.....

precise-production **ELECTROFORMING**

with **BARRETT SULFAMATE NICKEL**

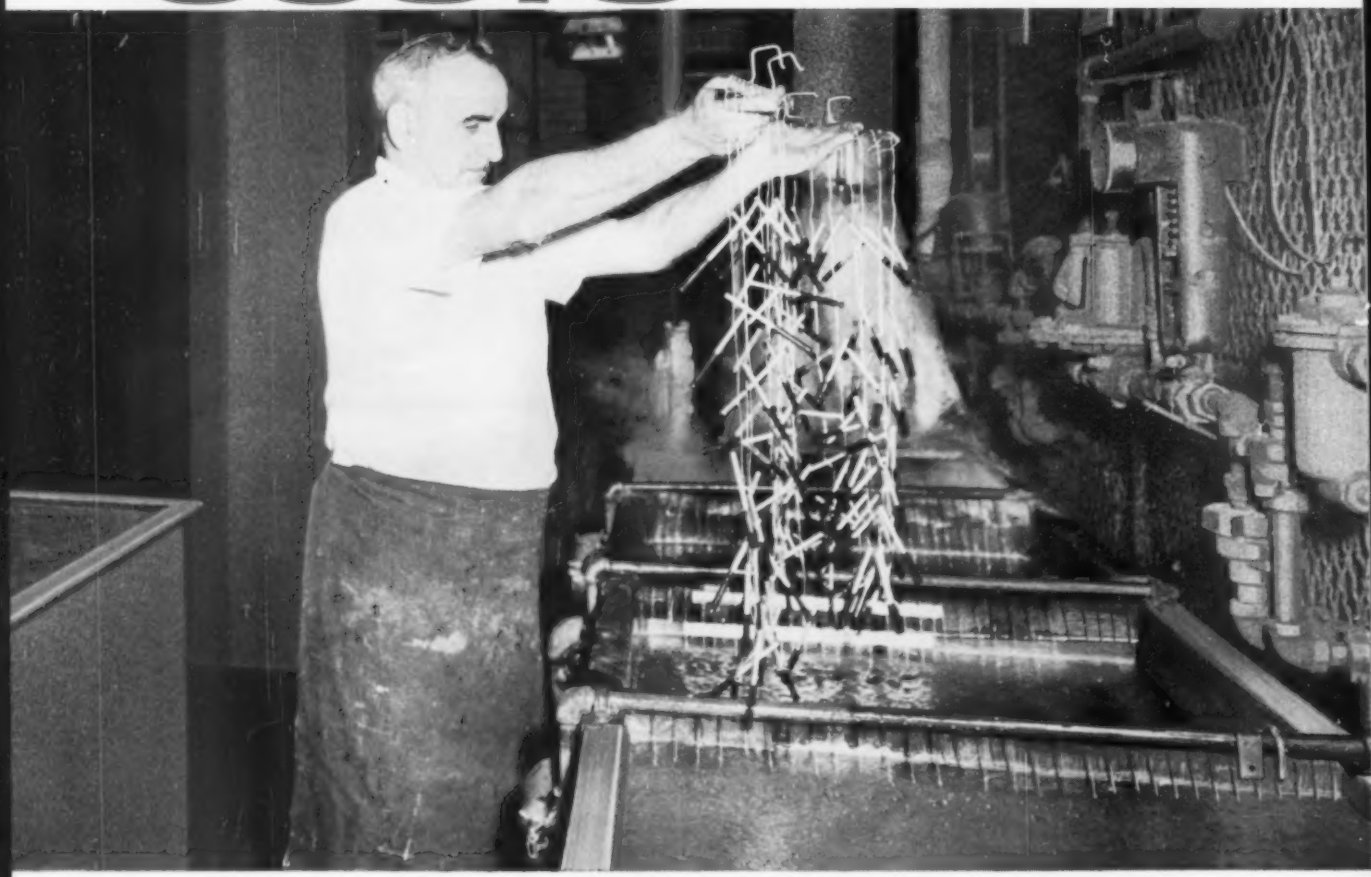
- exceptional low stress
- high speed deposition
- excellent machinability
- dimensional stability to thermal cycling
- less nodular growth
- superior throwing power
- excellent grain structure
- high chemical purity & density
- nickel to metal, glass, quartz or ceramic bonding

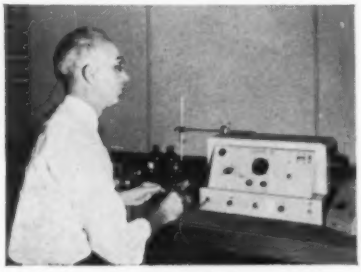
Request Bulletin SN

BARRETT
chemical products co., inc.

Shelton • Connecticut

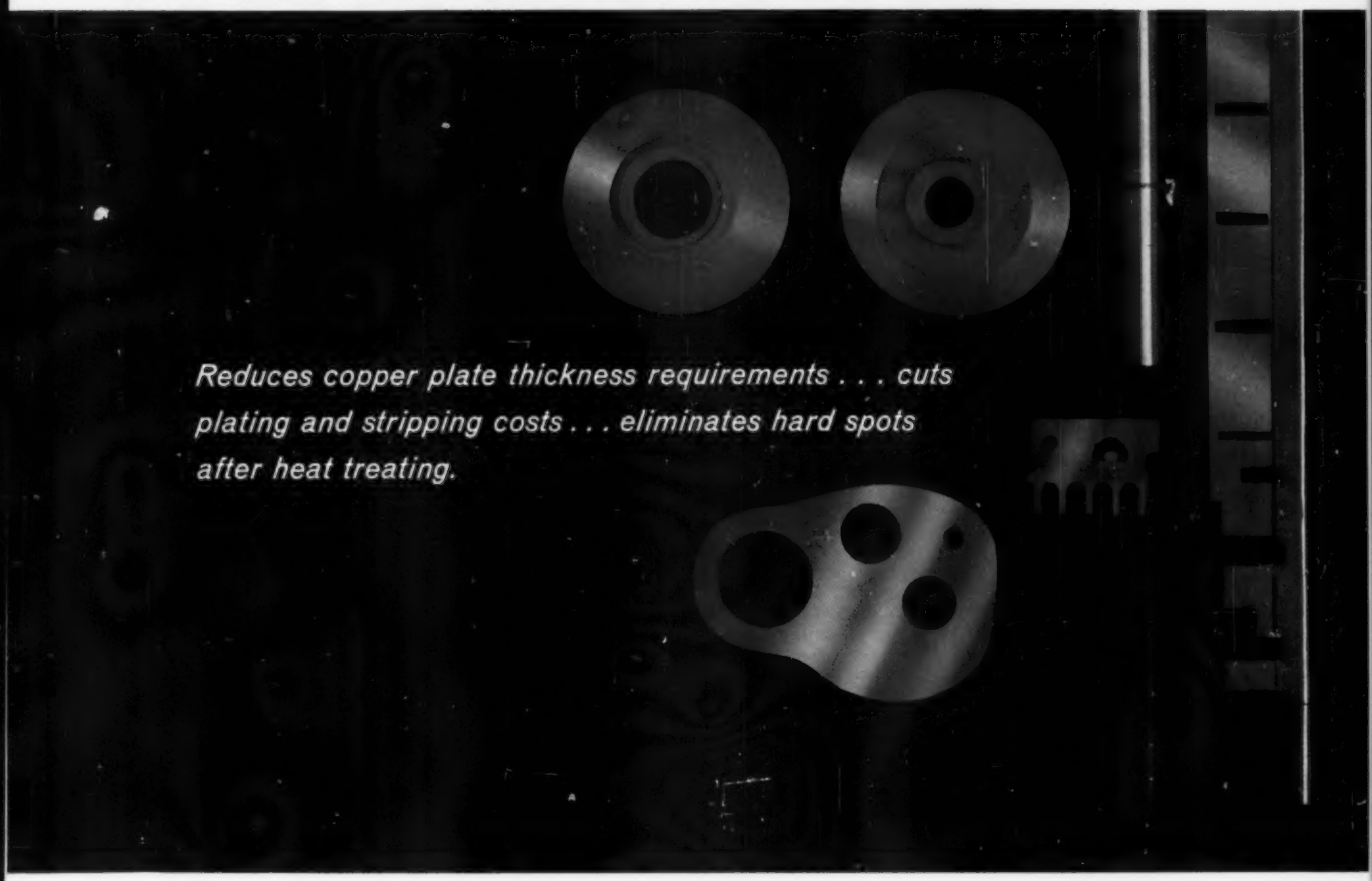
STEVCO COPPER PROCESS LOWERS COSTS *OF PLATING, STRIPPING*





Copper stop-off plate is rigidly held to .0003 to .0007 and is constantly verified during production runs by means of an Electronic Thickness Tester.

AND HEAT TREATING FOR BURROUGHS



Reduces copper plate thickness requirements . . . cuts plating and stripping costs . . . eliminates hard spots after heat treating.

Thousands of parts per day are copper plated prior to heat treating in a Stevco Cyanide Copper bath at the Burroughs Corporation, a world leader in the manufacture of business machines, office equipment and systems.

Stevco's dense grain structure minimizes required deposit thickness. The result is an important savings in copper stripping time, as well as in plating time.

Uniformity of deposit eliminates hard spots after heat treating. Subsequent machining operations, such as tapping and drilling, are simplified. Rejects are greatly reduced.

The many production economies offered by the Stevco Process on all copper plating operations are well worth investigating now. Call your local Stevens Representative for full details today. Or, write direct for further information:

frederic b. STEVENS, inc. DETROIT 16, MICHIGAN

Buffalo · Chicago · Detroit · Cleveland · Dayton · Wallingford (Conn.) · Indianapolis · Springfield (Ohio)

PLATING POWER BY DC POWER SPECIALISTS

RESEARCH

is a big word at RAPID ELECTRIC

Mathematical Design from Scripta Mathematica

Our new Brookfield plant exemplifies our continuing research and development program. Here, complete laboratory and test facilities help initiate new designs, and controls for greater rectifier economy and efficiency. Those savings are passed directly on to you—the user.

No matter if your power requirements are large or small, typical or different, required *yesterday* or in the near future, you can rely on RAPID because at RAPID power supplies are our SPECIALTY.

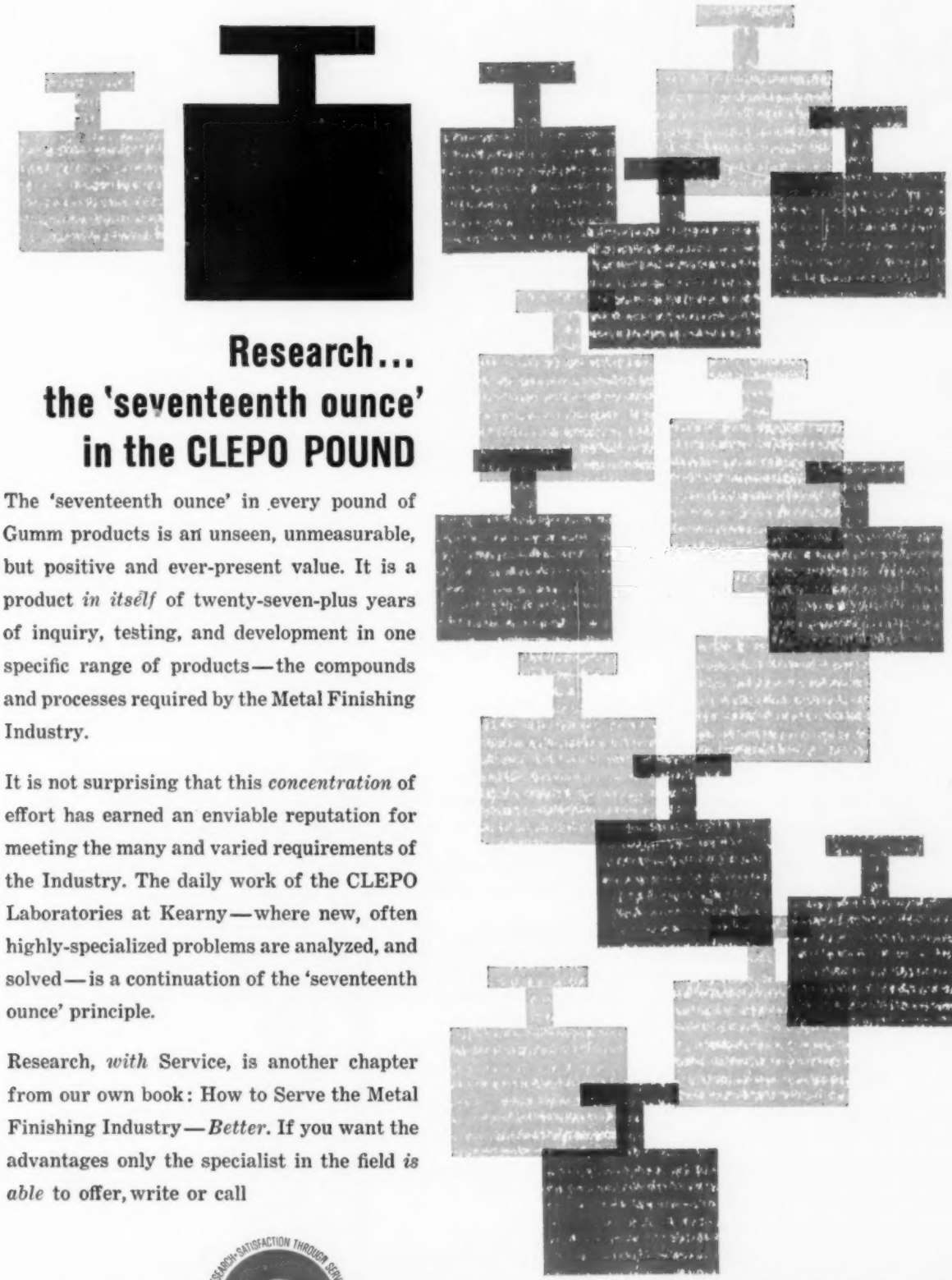
From the smallest bench model to the largest of the automatics, RAPID offers speed in delivery and the utmost in value.

All *our* resources are *yours*. From our engineering department to our complete test facilities and immense stock pile of components, our operating methods are passed on to you in PRICE, QUALITY and SERVICE.

Call your local RAPID distributor today (name available upon request).

RAPID ELECTRIC CO., INC.

2881 MIDDLETOWN ROAD • NEW YORK 61, N.Y. • TAlmadge 8-2200
PLANTS: (4) NEW YORK, N.Y. • GRAYSBRIDGE ROAD, BROOKFIELD, CONN



Research... the 'seventeenth ounce' in the CLEPO POUND

The 'seventeenth ounce' in every pound of Gumm products is an unseen, unmeasurable, but positive and ever-present value. It is a product *in itself* of twenty-seven-plus years of inquiry, testing, and development in one specific range of products—the compounds and processes required by the Metal Finishing Industry.

It is not surprising that this *concentration* of effort has earned an enviable reputation for meeting the many and varied requirements of the Industry. The daily work of the CLEPO Laboratories at Kearny—where new, often highly-specialized problems are analyzed, and solved—is a continuation of the 'seventeenth ounce' principle.

Research, *with* Service, is another chapter from our own book: How to Serve the Metal Finishing Industry—*Better*. If you want the advantages only the specialist in the field *is able* to offer, write or call

2FG-10

PROGRESS THROUGH RESEARCH-SATISFACTION THROUGH SERVICE
CLEPO

FREDERICK GUMM CHEMICAL COMPANY, INC.
538 FOREST STREET, KEARNY, NEW JERSEY

ANNOUNCING...

TECHNICAL PROCEEDINGS (1961 Edition) PUBLISHED: YOUR ORDER AWAITED

EMBODYING the full text of each of the technical papers delivered by experts before the 48th Annual Convention of American Electroplaters' Society, Inc. (AES) held in Boston, Massachusetts, June 18-23, 1961—including all of each paper's charts, diagrams, graphs, tables and other illustrations, and the transcript of the discussion that attended the delivery of each such paper—the internationally awaited 1961 Edition of the AES's annual book, TECHNICAL PROCEEDINGS, has been completed. A copy has now or will very soon reach every AES member in good standing, globally, as an entitlement of AES membership.

A veritable treasure chest of technical knowledge on electroplating, metal finishing, organic coating and allied arts that conforms with the standards of AES's previous annual editions, TECHNICAL PROCEEDINGS (1961 Edition) also presents the full text of each of the technical papers on the Finishing of Aluminum, Magnesium and Beryllium that composed the "Finishing of Light Metals" Symposium, a feature of AES's 48th Annual Convention.

The 1961 Edition also presents in full, the text of the third annual "William Blum Lecture" that was delivered at the Opening Educational Session of that AES Boston Convention by Dr. Charles L. Faust (Battelle Memorial Institute), third annual winner of the AES Scientific Achievement Award, the Society's highest scientific honor.

A list of the technical papers published in this voluminous repository of education on electroplating, metal finishing, organic coating and allied arts is spread in the adjacent column.

Having accommodated AES members with their entitled copies, AES, the book's exclusive publisher, now has a limited quantity of extra copies available for sale to AES non-members and others, so as to share the book's educational benefits.

HOW TO ORDER YOUR COPY

Orders for copies of the book will be accepted and processed by AES on strictly a "first come-first served" basis so long as its limited supply lasts. The book is unavailable for purchase elsewhere.

Within the continental limits of the United States, the domestic price of this 1961 Edition of AES's TECHNICAL PROCEEDINGS is $18 per copy including postage.

To those ordering from outside the United States' continental limits, the charge is $22 per copy including postage. (USA currency)

All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY, INC.

American Building • 443-445 Broad Street • Newark, N. J., U.S.A.

TECHNICAL PAPER CONTENTS

AES RESEARCH PROGRAM, THE, by Dr. D. Gardner Foulke, 1960-1961 Chairman, AES Research Committee

AES RESEARCH PROJECT NO. 14—A MICROSCOPIC STUDY OF CHROMIUM PLATING by Dr. M. H. Jones and J. Saiddington, Ontario Research Foundation

AES RESEARCH PROJECT NO. 15—PROGRESS REPORT ON THE DEVELOPMENT OF CORROSION TESTS FOR THE PERFORMANCE OF PLATED COATINGS by Walter L. Pinner, McGean Chemical Company, Project Chairman

ANODIC BEHAVIOR OF METALS IN CLEANING MEDIA—COPPER AND ITS ALLOYS, THE, by Samuel S. Frey, Oakite Products, Incorporated

ANODIC TREATMENTS FOR MAGNESIUM ALLOYS by J. S. Kirkpatrick, Brooks and Perkins, Incorporated

CHALLENGE BEFORE US, THE—"William Blum Lecture" by Dr. Charles L. Faust, Battelle Memorial Institute

CHEMICAL CONVERSION COATING FOR ALUMINUM ALLOYS by Dr. J. F. Murphy, Metallurgical Laboratories, Olin Mathieson Chemical Corporation

CHROMIC ACID ANODIZING OF BERYLLIUM: PROCESS DEVELOPMENT by Leo Missel, Missiles and Space Division, Lockheed Aircraft Corporation

CHROMIC ACID ANODIZING OF BERYLLIUM: PROCESS PARAMETERS by L. Whitby, E. Gowen and D. J. Levy, Missiles and Space Division, Lockheed Aircraft Corporation

CORROSION-CURRENT DATA FOR NICKEL-CHROMIUM COUPLES by W. H. Safranek, H. R. Miller and R. W. Hardy, Battelle Memorial Institute

EFFECT OF VOLTAGE DURING ANODIZING OF ALUMINUM by W. C. Cochran and F. Keller, Alcoa Research Laboratories, Aluminum Company of America

ELECTROPLATING OF ZINC-BASE DIE CASTINGS IN A SYSTEM INCORPORATING DUAL CHROMIUM by James H. Lindsay, W. E. Lovell, Ternstedt Division of General Motors Corporation, and D. W. Hardesty, General Motors Corporation Research Laboratories

EVALUATION OF SOLDERABILITY OF ELECTROPLATED COATINGS by L. K. Bjelland and J. M. Thompson, General Dynamics Pomona, A Division of General Dynamics Corporation

EXPERIENCE-PROVEN EPOXY-ACRYLIC FINISH SYSTEM by Robert F. Howard, Bell Helicopter Company

FUNCTIONAL VINYLS GO DECORATIVE by Fremont L. Scott and Hyman Metz, Metal and Thermit Corporation

IMPROVED ADHESION OF ELECTROLESS NICKEL PLATE ON TITANIUM ALLOYS by Milton Levy and John B. Romolo, Watertown Arsenal Laboratories

NICKEL-CHROMIUM PLATING UPON ANODIZED ALUMINUM by H. J. Wittrock, Kaiser Aluminum and Chemical Corporation

OBJECTIVES IN CORROSION PROTECTION OF BRIGHT DECORATIVE TRIM AND THEIR IMPLEMENTATION by John McDougall, Ford Motor Company

OUTDOOR EXPOSURE OF ANODIC COATINGS ON ALUMINUM: EFFECT OF SEALING by Dr. Roy C. Spooner, Aluminum Laboratories Limited

PLATING OF PRINTED CIRCUITS WITH PYROPHOSPHATE COPPER AND TIN-NICKEL by R. W. Couch and R. G. Bikales, Metal and Thermit Corporation

PLATING ON MAGNESIUM BY ELECTRODEPOSITION AND CHEMICAL REDUCTION METHODS by H. K. DeLong, Technical Service and Development Laboratory, Dow Metal Products Company, Division of the Dow Chemical Company

PRACTICAL APPLICATION OF STATISTICS TO THE QUALITY CONTROL OF ELECTROPLATED PRODUCTS, THE, by James J. Glass and James K. Gore, Los Alamos Scientific Laboratory

PRECIOUS METAL PLATING AND SOLDERABILITY—A PRELIMINARY REPORT by A. Korbelak and R. Duva, Sel-Rex Corporation

PRODUCING ULTRA HIGH FREQUENCY ELECTRONIC PARTS BY ELECTROLESS COPPER AND PRECIOUS METAL PLATING OF PLASTICS by Charles E. MacNeill, Materials Engineering and Development, Orlando Division, The Martin Company

QUALITY CONTROL STUDY TO DETERMINE OPTIMUM CONDITIONS FOR BARREL PLATING IN ZINC CYANIDE SOLUTIONS by Dr. Russel E. Harr, Western Electric Company

STOICHIOMETRY OF COPPER BONDING USING COPPER OXIDE by Edward B. Murphy and Thomas P. Turnbull, Massachusetts Institute of Technology, Lincoln Laboratory

VAPOR DEPOSITION OF ALUMINUM BY THERMAL DECOMPOSITION by Edgar H. Maus Sr., Queen City Steel Treating Company

Is there really a difference in Anodes?

You can bet your bottom dollar there's a difference!

It's based on the premise that, in an ideal plating bath, copper should dissolve evenly . . . ion-by-ion . . . and plate out evenly . . . ion-by-ion.

That's the kind of plating action you can get when you use OFHC® brand copper anodes. They give you maximum amounts of usable copper, reduced scrap, reduced sludge, and, most important, fewer rejected castings from rough plating.

Reason: OFHC anodes contain no dissolved oxygen or residual oxides. And because oxides are absent you are assured of orderly ion-by-ion dissolution even near the grain boundaries. You avoid premature release of small copper grains from the anode which either float to the cathode, causing roughness, or, if large enough, sink to the tank bottom as wasted copper.

In addition, the high, 99.99+% purity of OFHC anodes practically eliminates the insolubles that result in sludge. You not only reduce down time for sludge removal, you also reduce the possibility of the insolubles settling on the work to cause roughness.

Freedom from voids and porosity gives you further assurance of smooth plating.

Yes, there is a difference in anodes. Try an OFHC anode yourself and see. They are available in shapes to fit your needs . . . in any length up to 96 inches. Phone your OFHC Anode distributor or write to our AMCO Technical Service Department.

AMAX

AMCO DIVISION

AMERICAN METAL CLIMAX, INC.

1270 Avenue of the Americas, New York 20, N.Y.

miniature 10 and 25 g.p.h.
FILTER SYSTEMS

FILTERS & CIRCULATES
SENSITIVE, CORROSIVE, PRECIOUS SOLUTIONS • SOLVENTS

FOR laboratories, pilot plants and small batch process industries

FEATURES
- Needs only 8" x 9" bench space
- Lucite (140°F. max.) or pyrex-epoxy (250°F. max.) chambers , also teflon, etc.
- Dynel, porous stone or porous carbon filter tubes
- Leakproof epoxy centrifugal pump
- Self-primer available
- Continuous duty ball bearing motor

Model LAI-1 up to 10 g.p.h. $98.
Model LAI-3 up to 25 g.p.h. $125.

FREE BULLETIN
Send for your Sethco Bulletin 602 for complete technical data on LAI portable filter systems today.

Sethco. MANUFACTURING CORP.
2290 Babylon Turnpike, Merrick, N. Y. MA 3-4220

DEPTH FILTRATION FOR ALL ELECTROPLATING AND INDUSTRIAL APPLICATIONS • METAL FINISHING • PHOTO PROCESSING • PETROLEUM • SOLVENTS • LACQUERS • PHARMACEUTICALS • ULTRASONIC CLEANERS • RADIOACTIVE SOLUTIONS • WATER • ELECTROTYPING

ARTICLE REFERENCES

By WILLIAM TUCKER
Eastman Kodak
Rochester, N. Y.

Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

107. ALLOYS
VARIATION OF COMPOSITION WITH THICKNESS IN THIN ELECTRODEPOSITED FILMS OF NICKEL-IRON ALLOYS.
G. H. Cockett and E. S. Spencer-Timms.
Journal of the Electrochemical Society, September 1961, *108*, No. 9, pp. 906–908.

108. CHROMIUM
THE STRUCTURE AND HARDNESS OF ELECTRODEPOSITED CHROMIUM.
C. P. Brittain and G. C. Smith.
The Journal of the Institute of Metals, July 1961, *89* (11), pp. 407–416.

109. CONVERSION COATINGS
HOW TO GET THE MOST FROM PHOSPHATING SYSTEMS—II.
George H. Pimbley.
Metal Progress, September 1961, *80*, No. 3, pp. 108–111, 128, 131A–134.

110. COPPER
SOME OBSERVATIONS OF COPPER DEPOSITS ON SINGLE CRYSTALS OF COPPER.
Isaac Giron and Fielding Ogburn.
Journal of the Electrochemical Society, September 1961, *108*, No. 9, pp. 842–846.

111. CORROSION
a. *THE REACTION BETWEEN ANODIC ALUMINUM OXIDE AND WATER.*
Walter J. Bernard and John J. Randall, Jr.
Journal of the Electrochemical Society, September 1961, *108*, No. 9, pp. 822–825.

b. *WHY DOES STAINLESS STEEL CORRODE?*
Morgan Sinclaire and Eugene Phillips.
Metal Progress, September 1961, *80*, No. 3, pp. 92–96.

112. ELECTROPLATING
THE ANODE SIDE OF THE STORY PART III.
John B. Winters.
Plating Management, September 1961, pp. 19–21, 28.

113. EMBRITTLEMENT
HYDROGEN EMBRITTLEMENT OF HIGH STRENGTH STEELS. RECENT RUSSIAN EXPERIENCE.
Larissa Domnikov.
Metal Finishing, September 1961, *58*, No. 9, pp. 52–55.

114. MAGNESIUM
FINISHING PROCEDURES FOR MAGNESIUM AND MAGNESIUM BASE ALLOYS.
Lester F. Spencer.
Metal Finishing, September 1961, *58*, No. 9, pp. 56–59, 62 (con't.).

115. CHROMIUM
JAPAN READIES RIVAL FOR CAN MARKET.
Iron Age, September 7, 1961, *188*, No. 10, p. 75.

116. MECHANICAL FINISHING
ABRASIVE BLAST CLEANING.
David E. Neustadt.
Metal Finishing, September 1961, *58*, No. 9, pp. 60–62.

117. MISCELLANEOUS
ANTI-SEIZE COATINGS FOR CHROME ALLOY BOLTS AT ELEVATED TEMPERATURES.
W. B. Stephenson, Jr.
Metal Finishing, September 1961, *58*, No. 9, pp. 63–64.

118. NICKEL
SCIENCE FOR ELECTROPLATERS—67. BRIGHT NICKEL.
L. Serota.
Metal Finishing, September 1961, *58*, No. 9, pp. 70–74.

119. ORGANICS
a. *ORGANIC CONVERSION COATINGS FOR IMPROVED PAINT AND ADHESIVE BONDING TO ALUMINUM SURFACES.*
R. J. Lipinski.
Metal Finishing, September 1961, *58*, No. 9, pp. 44–51.

b. *SOME ADVANTAGES OF SOLVENT-FREE, THICK-FILM EPOXY COATINGS.*
R. G. Fortener.
Corrosion, September 1961, *17*, No. 9, pp. 9–11.

c. *CHARACTERISTICS OF TROWELABLE PLASTIC COATINGS FOR CORROSION CONTROL.*
J. H. Cogshall and Allen M. Smith III.
Corrosion, September 1961, *17*, No. 9, pp. 28–34.

d. *PRECOATED METAL GETS NEW LINE.*
Iron Age, September 7, 1961, *188*, No. 10, p. 112.

120. SPECIFICATIONS
FINISHING TO GOVERNMENT SPECIFICATIONS.
Boris B. Joffe.
Metal Finishing, August 1961, *59*, No. 8, pp. 61–64.

(*Continued on page 1202*)

Sethco
MFG. CORP.
Now, HIGH TEMPERATURE TO 250° F.
SUBBA-5, -10 and -20
SUBMERGED FILTER SYSTEMS
with totally enclosed, ball-bearing, continuous duty, fan-cooled, 3400 r.p.m., 1/4-1/2 h.p., brushless AC motor.
SUBBA-5 price, includes 1/4 h.p., AC motor, Stainless Steel Mounting Brackets and Hose
$215
Model SUBBA-5
ONE YEAR GUARANTEE
FOR COMPLETE SPECIFICATIONS SEND FOR DATA SHEET 551B
JET AGITATION INDEPENDENT OF FILTRATION
Sethco
MANUFACTURING CORP
2290 Babylon Turnpike, Merrick, N. Y.
MA 3-4220
DEPTH FILTRATION FOR ALL ELECTROPLATING AND INDUSTRIAL APPLICATIONS • METAL FINISHING • PHOTO PROCESSING • PETROLEUM • SOLVENTS • LACQUERS • PHARMACEUTICALS • ULTRASONIC CLEANERS • RADIOACTIVE SOLUTIONS • WATER • ELECTROTYPING

SHOP BULLETIN F60-17
Discontinuation
Polishing & Buffing Operations
August 8, 1960
Effective immediately all polishing and buffing operations on AMES MAID items, prior to plating, are to be discontinued.
C.D. Memel

Ames said goodbye completely to polishing and buffing when SUPERLUME came along

Ray Schlotterbeck exhibits a few Ames products plated with Superlume. Above him, another testimonial to Superlume's superiority . . . Shop Bulletin F60-17.

Reports RAY SCHLOTTERBECK,
Plating Superintendent for the world's largest maker of Shovels and Garden Tools (since 1774), as well as famous AMES MAID and AMES AIRE Tubular Furniture.

One month after Superlume bright nickel bath went into operation at O. Ames Company, Parkersburg, W. Va., the official bulletin shown declared *all* polishing and buffing there no longer necessary.

Ames had been polishing 5000-6500 parts a day, first switched to Superlume just to give its products added eye-appeal. When Superlume produced a greater depth of color *without* polishing than previous baths gave *with*, Ames got a tremendous bonus: *A reduction in its over-all finishing costs of 10 to 12%.*

"I never saw a bath that levels better," says Ray Schlotterbeck, "nor one that throws or brightens better, either." And Ames sales people add, "Our product quality was never higher."

Results like these are common with Superlume. Ask H-VW-M for full details.

H-VW-M

Progress in metalfinishing through advanced processes • equipment

Hanson-Van Winkle-Munning Company, Matawan, New Jersey
Offices in Principal Cities
Alert Supply Company is H-VW-M in the West
Los Angeles • San Francisco

121. TESTING

a. *CORROSION, CORRODKOTE, KESTERNICH, CHROMIUM, COPPER AND NICKEL.*
Products Finishing, September 1961, pp. 60–76. (German Abstract on Corrosion Tests.)

b. *IMPROVED METHOD FOR MEASURING ABRASION RESISTANCE OF COATINGS.*
Products Finishing, September 1961, pp. 82–86.

c. *TESTING PROTECTIVE COATINGS ON METALS.*
Paul Smits.
Metal Progress, September 1961, *80*, No. 3, pp. 75–79.

122. THEORETICAL

THE NATURE OF ULTRASONIC VIBRATIONS.
Peter Lord.
Ultrasonic News, Summer, 1961, pp. 10–11, 14–18.

123. TIN

TIN PLATE REPLACES SOLDER COAT ON TRANSISTOR SHELLS.
Walter P. Alina.
Products Finishing, July 1961, pp. 36–39.

124. ULTRASONICS

a. *ULTRASONIC CLEANING FUNDAMENTALS.*
Gilbert Tint.
Products Finishing, June 1961, pp. 50–56.

b. *LOOKING AHEAD IN ULTRASONICS.*
Albert Valente.
Products Finishing, June 1961, pp. 58–60.

125. VACUUM COATINGS

a. *PROTECTIVE PROPERTIES OF VACUUM COATINGS—PRESENT AND FUTURE TECHNIQUES.*
N. A. Lockington and I. J. Toth.
Corrosion Technology, June 1961, *8*, No. 6, pp. 168–172.

b. *CONVEYS OF SPEED PAINTING OR DIE CASTINGS.*
Ezra A. Blount.
Products Finishing, June 1961, pp. 36–41.

The following are Metallurgical Abstracts from The Journal of the Institute of Metals, April 1961, pp. 669 and 689:

ALLOY
Relation Between Cathodic Polarization and Texture of an Iron-Cobalt Alloy Electrodeposit. A. L. Rotinyan, E. N. Molotkova, and O. M. Danilovitch (Tsvet. Metallurgiya, 1960, (4), pp. 49–52. (In Russian).

COPPER
Mechanism of Copper Electrodeposition from Complex Copper Salts with Ethylenediamine in Aqueous Solutions. N. V. Osetrova and P. S. Titov. (Tsvet. Metallurgiya, 1960, (1), pp. 154–163). (In Russian).

ULTRASONICS
How to Get the Most from Ultrasonic Cleaning. Paul W. Steen (Elect. Manufacturer, 1960, 5, (7), pp. 24–27).

The following are Metallurgical Abstracts taken from The Journal of the Institute of Metals:

June 1961 Issue—page 803

ANODIZING
Two-Stage Anodizing of Aluminum and Its Alloys by the HI Barrier "EC" Process. C. C. Cohn and H. Sosson (Werkstoffe u Korrosion, 1960, 11, (10), pp. 616–621.

Investigation of the Structure and Other Properties of Hard Oxide Films on Aluminum Produced by Anodic Oxidation. Edith Lichtenberger-Baja, A. Domony, and P. Csokan (Werkstoffe u Korrosion, 1960, 11, (11), pp. 701–707.)

May 1961 Issue—page 741

CADMIUM
Microscopical Observations During the Deposition of Electroplated Coatings (of Cadmium). Franz Rämmele (Metalloberfläche, 1960, 14, (12), pp. 373–379.)

The following are Metallurgical Abstracts taken from The Journal of the Institute of Metals, July 1961, pp. 897–899:

ALLOYS
The Effect of Brighteners on the Electrodeposition of Iron-Chromium-Nickel Alloys. Willi Machu and M. F. M. El-Ghandour (Werkstoffe u. Korrosion, 1960, 11, (10), pp. 628–631).

CORROSION
The Corrosion-Behaviour of Decorative Copper/Nickel/Chromium Coatings on Steel. H. M. Heiling (Metall, 1960, 14, (6), pp. 549–561).

RHODIUM
Crack-free Rhodium Coatings. F. H. Reid Metalloberflache, 1961, 15, (2), pp. 33–37). Cf. R., Trans. Inst. Metal Finishing, 1956, 33, 105; M. A., 24,588.

Corrosion
National Association of Corrosion Engineers
1061 M & M Building
1 Main Street
Houston 2, Texas

Corrosion Technology
Stratford House
9 Eden St.
London, N. W. 1
England

Iron Age
Chestnut & 56th St.
Philadelphia 39, Pa.

J. Electrochemical Society
1860 Broadway
New York 23, N. Y.

J. Institute of Metals
17 Belgrave Square
London, S.W. 1, England

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
American Society for Metals
Metals Park
Novelty, Ohio

Products Finishing
431 Main St.
Cincinnati, Ohio

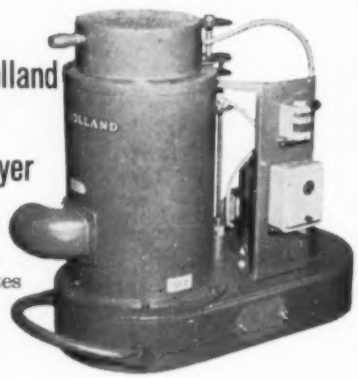
Plating Management
60 Bently Road
Cedar Grove, N. J.

Ultrasonic News
100 Stevens Ave.
Mount Vernon, N. Y.

DOUBLE ACTION

drying speeds up production!

Model 20 New Holland KREIDER Centrifugal Dryer



Air-dries . . . as it Spin-dries! Eliminates scoring and marring . . . speeds up production . . . cuts down on rejects!

SPECIFICATIONS:

1-h.p. motor—220, 440, 550 volts—2 or 3 phase. Spins 75-lb. loads at 825 r.p.m. Quiet V-belt drive. Arc-welded steel plate construction. Weight 490 lbs. Requires minimum floor space. Meets N.E.C. specs. Auxiliary electric or steam heating units available as optional equipment.

Send for illustrated 4-page folder. Write Dept. P-1161

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

Zialite

Reg. U. S. Pat. Off.

for NICKEL PLATING

DIRECTLY on ZINC DIECASTINGS, Aluminum, Brass, Copper, Lead, Iron, and HYDRO-T-METAL.
TREMENDOUS THROWING POWER, COVERS SMOOTHLY parts made up of several metals.

for HARD CHROMIUM

USE Zialite ADDITION AGENTS
Harder CRACK FREE deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.

ZIALITE CORPORATION
92 GROVE STREET WORCESTER 5, MASS.

Singleton

"LOW BOY"

Fastest Barrel in Plating!

Ask for brochure and Prices on all Singleton barrel-plating equipment.

The Singleton Company
11760 Berea Rd., Cleveland 11, Ohio CL 1-5580

CREATIVE RESEARCH • QUALITY PRODUCTS • PROFESSIONAL SERVICE

an acid salt product for plating in easy-to-handle powder form

no handling hazards

no breakable carboys

Introducing PICTAX for acid pickling

New PICTAX® brings to platers a dry acid salt that is not only more convenient to use, but also provides brighter electrodeposits through better metal activation. Plating is more adherent . . . stains are eliminated . . . over-all plating quality is much improved. PICTAX has reserve acidity to give pickle baths longer life—so you don't have to change your baths as often. PICTAX is completely soluble and free-rinsing. Ask your Wyandotte representative about new PICTAX today.

Wyandotte Chemicals

J. B. FORD DIVISION

WYANDOTTE, MICHIGAN • LOS NIETOS, CALIFORNIA • ATLANTA, GEORGIA

ANNOUNCING...

AT A SPECIAL PRICE TO AES MEMBERS...

HYDROGEN EMBRITTLEMENT IN METAL FINISHING

Edited by

DR. HAROLD J. READ

Professor of Physical Metallurgy, College of Mineral Sciences
Pennsylvania State University

CONTENTS AND CONTRIBUTORS

1. The Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing by Harold J. Read.
2. On the Mechanism of Transport of Hydrogen Across a Solution-Metal Interface by Richard J. Barton.
3. The Behavior of Hydrogen in Iron and Steel by Maynard L. Hill.
4. Measurements Pertaining to Hydrogen Embrittlement by Cloyd A. Snavely.
5. Detection and Measurement of Sorbed Hydrogen by Samuel C. Lawrence Jr.
6. A New Look at the Hydrogen Embrittlement of Cadmium-Coated High Strength Steels, by Norman M. Geyer, G. William Lawless and Bennie Cohen.
7. The Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra-High Strength Steel by Walter Beck and Edward J. Jankowsky.
8. Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate by W. F. Hamilton and Myron Levine.
9. A Review of Some Studies in the Phenomena and the Control of Hydrogen Embrittlement by Harold J. Read.

SPONSORED by American Electroplaters' Society, Inc. (AES), this book is based upon technical papers presented at the "Hydrogen Embrittlement in Metal Finishing" Symposium held at the AES's 47th Annual Convention, Los Angeles, California, July 24-28, 1960.

In addition to those papers, the Editor has written and included special material which deals with practical operating data, plant information and other facts of practical value to metal finishers and users of finished materials.

1961. APPROX. 240 PAGES

HOW TO ORDER YOUR COPY

SPECIAL PRICE TO

AES MEMBERS.....$6.50 each

PRICE TO AES NON-MEMBERS...$7.50 each

All orders must be accompanied by payment in full, by check or money order (USA currency).

USE THIS CONVENIENT ORDER FORM

AMERICAN ELECTROPLATERS' SOCIETY, Inc.
443-445 Broad Street, Newark 2, N. J., USA

Please rush.....copy (ies) of HYDROGEN EMBRITTLEMENT IN METAL FINISHING

at AES special member price $6.50 per copy ☐
at non-member price of $7.50 per copy ☐

I am enclosing payment (or purchase order with payment) and understand the price includes free delivery anywhere in the U. S. A.

NAME (please print).....

ADDRESS.....

CITY & ZONE.....STATE.....

LEA

ABRASIVE FINISHING METHODS

NICKEL and NICKEL ALLOYS

STAMPINGS • CASTINGS • FORGINGS • FORMINGS • DIE CASTINGS

Pure nickel and the high nickel alloys may be finished to any of the mechanically produced effects obtainable on white metal, ranging from a sand blast finish to the high lustrous mirror finish. A satin finish can be produced with fewer operations and very much less time than is required for a high lustre polish. No short cuts for developing a desired effect are possible. A "base" from which all surface defects have been removed must be produced and on this the finish is developed. The coarser the abrasive required to produce this "base", the more operations required to produce the desired finish. Each subsequent operation must remove the wheel marks produced by the preceding operation.

Nickel Silver, because of the quantity used in the metal industry, must be considered as one of the most important of the nickel alloys. However, because of its high copper content and tendency to tarnish, it is seldom used by itself but generally as a base metal for subsequent electrodeposits. It is much easier to machine and abrade than harder nickel alloys and responds more readily than the higher nickel alloys to cut-down buffing.

Nickel is one of the most important metals applied by electrodeposition and the finishing of nickel plate will be covered separately.

POLISHING... Recommended polishing speeds for nickel alloys are about 6500 to 7500 sfm. Recommended wheels are sewed buffs, felt, canvas and leather polishing wheels, coated with **Leabrament** or **Plasti-Brade** (liquid abrasive compositions). If loose abrasives are used for preparing polishing wheels, **Gripmaster** or **Plasti-Glue** polishing wheel cements should be used.

INTERMEDIATE FLEXIBLE POLISHING... To remove small defects, flash, etc. and produce a uniform finish, use **Grade "C"** or **Grade "N" Lea Compound** on sewed buffs at 6000 sfm. A special application of this is in the edging of nickel silver flatware immediately after trimming. For this, **Grade "C" Lea Compound** is used on an 8" diameter, 6" face packed muslin buff at 2400 rpm.

SATIN FINISHING... For the production of a satin finish, **Grade "N" Lea Compound** is recommended on a high count full-disc muslin buff at 5500 sfm. Finer and coarser grades of **Lea Compound** are available.

BRIGHT FINISHING—Bar Compositions... To prepare the surface of nickel silver for plating, it is generally given a cut-down buffing operation with a Tripoli composition such as **Grade 765 Learok** on a pocketed or ventilated buff at about 8000 sfm.

To produce a bright finish on high nickel alloy base metals, the following procedure has been used to advantage: cut-down buffing with **Grade 316 Learok** on a loose muslin buff at 7500 sfm; then color buff on the same type of wheel and at the same speed using **Grade 302-C Learok.**

BRIGHT FINISHING — Liquid Compositions... For **cutting down** operations use **Grade TH52P Liquabrade.** For **coloring operations** use **Grade UF47J Liquabrade.** For **high coloring** use **Grade UH20A Liquabrade.** Buffs and speeds for use with **Liquabrade** are the same as for Bar Compositions.

BUTLER FINISHING... Butler Finishing is carried out after bright finishing with **Grade "B-12"** and **Grade "MH" Lea Compound** at about 5000 sfm.

THE LEA MANUFACTURING CO.

16 CHERRY AVE., WATERBURY 20, CONN.

Lea-Michigan, Inc., 14459 Wildemere, Detroit 38, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Co. of England, Ltd., Byron St., Buxton, Derbyshire, England
Lea-Ronal, Inc. Main Office and Laboratory: 130-19 180th St., Jamaica 34, N. Y.
Sales & Manufacturing Plant: 235 East Aurora St., Waterbury 20, Conn.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok . . . Industry's quality buffing and polishing compounds for over 30 years.

The Hallmark of Quality Products

Are you interested in plating specialties? SEE THE OTHER SIDE OF THIS INSERT

ABRASIVE FINISHING
NICKEL and NICKEL ALLOYS

AURALL GOLD* (24K)

passes the toughest nitric acid test

Pieces . . . . . electrical connectors
Plate . . . . . 100 millionths of an inch
Place . . . . . customer's plant
Test . . . . 30 minutes in boiling concentrated nitric
Results . no sign of corrosion or attack on base metal

Comparative tests on parts plated with same thickness of gold from both conventional cyanide and acid golds showed complete attack of the base metal in less than 10 minutes.

Make this simple comparative test with your own gold plate and see the advantages the Aurall Gold offers you. It is possible to obtain complete protection with lesser thickness of plate with Aurall Gold, thereby saving in gold.

Aurall Gold will provide not only the answer to simplification of your plating operations but substantial improvements in corrosion protection, freedom from porosity, and the ability to withstand high temperatures without discoloration.

Full details will be sent promptly on request.

Piece shown in the headline is four times actual size.

OTHER AURALL GOLD FEATURES

- ★ Bright to lustrous, all-inclusive 24K gold plating process.
- ★ Exceptional resistance to high temperature discoloration.
- ★ Meets critically exacting industrial and scientific requirements where high degree of ductility, freedom from porosity and excellent solderability are required.
- ★ Completely stable bath; operable over a wide temperature range; excellent throwing power.
- ★ Combines advantages of cyanide and acid baths in one solution that does not deteriorate with age or in prolonged operation.
- ★ Simple to operate; easy to control.

*Patents pending

The LEA GROUP
serving the Finishing Field
Lea-Ronal, Inc., Jamaica, N. Y.
Lea-Michigan, Inc., Detroit
The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Ltd
Lea Mfg. Co., of England, Ltd
Plating Polishing Buffing Burring

Lea-Ronal Inc.

Sales and Manufacturing Plant:
235 East Aurora Street, Waterbury 20, Conn.
Main Office and Laboratory:
130-19 180th Avenue, Jamaica 34, N. Y.

Are you interested in Buffing, Polishing and Burring Specialties?
SEE OTHER SIDE OF THIS INSERT.

COMPOSITION OF COBALT-NICKEL FILMS

by IGNATIUS TSU*

ABSTRACT

Many factors influence the magnetic characteristics of electroplated cobalt-nickel films. One of these is film composition. It is governed by the Co^{++}/Ni^{++} ratio in the plating bath, the addition agents, the bath pH, and the use of superimposed ac/dc. The results of this investigation indicate that the optimum magnetic properties are found in films composed of 20 to 40 per cent nickel. Because of factors other than film composition, the magnetic properties of electroplated cobalt-nickel films vary from bath to bath.

1.0 INTRODUCTION

ELECTROPLATED COBALT-NICKEL FILMS are used extensively as magnetic recording media. They are in demand because they offer such advantages as simplicity of preparation, desired film thicknesses, and ease of obtaining a wide range of controlled magnetic properties.

The well known factors which influence the magnetic characteristics of a cobalt-nickel film are: film composition (cobalt-nickel ratio), strain, crystallite size, and preferred crystal orientation. It is conceivable that a change in film composition will affect the other factors, and consequently, change the magnetic properties. However, the effect of film composition on the magnetic properties particularly coercive force, H_c, is dominant.

Several types of plating baths are currently used for electroplating cobalt-nickel films. These include the Watts baths (with additions of Co^{++}),[1-4] the hypophosphite baths (containing $H_2PO_2^-$)[5] and the sulfamate baths.[6,7] In this paper the methods of changing compositions in films obtained from Watts and sulfamate baths are considered.

In plating cobalt-nickel films (from almost any type of bath), if the bath *p*H is increased, the coercive force increases.[7,8] A minor change in film composition also occurs when bath *p*H is varied.

Other methods are used for increasing coercive force: (1) plating with superimposed ac/dc,[1-4] and (2) plating with periodic reverse current.[9] The exact mechanism by which superimposed ac/dc and periodic reverse currents affect the magnetic properties is not known, but the effect of ac/dc on film composition has been observed in this study.

The magnetic properties of cobalt-nickel films are also affected by addition agents.[2,8,10] The effect of these addition agents on film composition has also been observed and will be discussed in this paper.

2.0 EXPERIMENTAL

Two baths, the Watts type (Zapponi bath[3]) and the new cobalt-nickel sulfamate bath[7] formulated by the author, were used for the experiments. The compositions of these baths are:

Zapponi Bath

Cobalt Chloride $CoCl_2 \cdot 6H_2O$ ..... 100–300 g/l
Nickel Chloride $NiCl_2 \cdot 6H_2O$ ..... 100–300 g/l
Boric Acid H_3BO_3 ..... 25– 40 g/l
*p*H (KOH, HCl) = 3.0–6.0
Temperature = 60–75C.
Current Density (dc) = 100 asf
AC/DC Ratio = 1.0–5.0
Co^{++}/Ni^{++} Ratio varied for different compositions.

Sulfamate Bath

Co^{++} (as Chloride) ..... 4.96–24.80 g/l
Ni^{++} (as Carbonate) ..... 14.85 g/l
$NH_2SO_3^-$ (as Sulfamic Acid) ..... 59.40 g/l
*p*H (KOH = 1.5–7.0
Temperature = Room Temperature.
Current Density (dc) = 4.5–5.0 asf (1.7 volts)
Co^{++}/Ni^{++} Ratio varied for different compositions.

Addition agents used in these experiments include thiocyanates, thiourea, substituted thioureas, thioacetamide, thiosemicarbazide, 2-thiobarbituric acid, and carbon disulfide. C=S is a functional group in each of these addition agents.

* General Products Division, International Business Machines Corporation, San Jose, California.

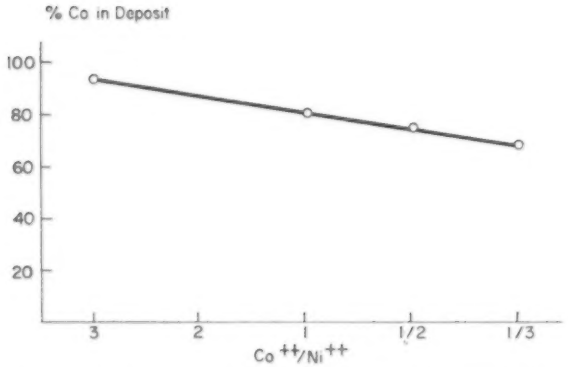


Fig. 1. Per cent cobalt vs. Co^{++}/Ni^{++} ratio (Zapponi bath ac/dc = 3)

Effects on magnetic properties were studied as a function of the amount of C = S added. For example, there is one gram of C = S in 2.2048 grams of potassium thiocyanate (KCNS). Therefore, one milliliter of 2.2048 g/l of potassium thiocyanate solution contents one milligram of C = S.

All samples were plated on copper clad phenolic substrates (area = one by three inches), and x-ray fluorescent techniques were used for analyses of film compositions. Sixty-cycle B-H loop tester was used to measure the H_c, B_r, and B_m.

3.0 DISCUSSION

The film composition can be altered by changing the ratio of Co^{++}/Ni^{++} in the plating baths. Figure 1 shows the relationship between the film composition and the Co^{++}/Ni^{++} ratio in Zapponi's all chloride bath. Figure 2 shows the film composition versus the Ni^{++}/Co^{++} ratio in the sulfamate bath.

Addition agents with a functional group of C = S influence the film composition in nickel-alloy codeposition.[11, 12] The relative deposition rate of nickel with respect to the codepositing metal is changed by the addition of C = S, thereby, changing the nickel content in the deposit.

Cobalt-nickel films containing 33.5 per cent nickel can be electroplated from the sulfamate bath. An increase of nickel content in the films to 66.5 per cent was observed after adding 100 mg/l of C = S to the sulfamate bath. The per cent increase in nickel content of films depends on the amount of C = S added to the cobalt-nickel plating bath (for C = S concentration less than 200 mg/l); this is illustrated in Fig. 3 with the sulfamate bath. Table I shows the increase in nickel content as a result of adding C = S to the Zapponi bath.

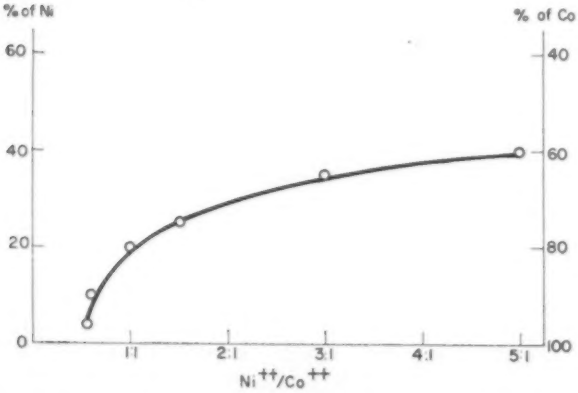


Fig. 2. Co-Ni composition vs. Ni^{++}/Co^{++} ratio in solution (pH = 6.5; plating voltage = 1.7 v) (sulfamate bath).

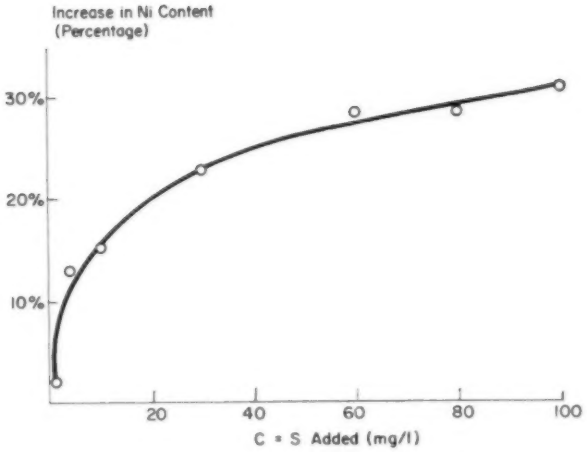


Fig. 3. Per cent increase in nickel content vs. the amount of C = S added ($Ni^{++}/Co^{++} = 3.0$; pH = 6.5) (sulfamate bath).

TABLE I

INFLUENCE OF ADDITION AGENTS ON FILM COMPOSITION

Zapponi Bath Co^{++}/Ni^{++} = 2.9; ac:dc = 3:1	**0 C = S**	**5 mg/l C = S**
Film Composition	91.7%Co–8.3%Ni	79%Co–21%Ni
H_c (1000 oersteds drive)	75oe	200 oe.

Various plating parameters may also affect the influence of C = S on the deposition rate of nickel. For example, the influence of Ni^{++}/Co^{++} ratio in the bath is presented in Fig. 4.

Superimposed ac/dc is used during plating to increase H_c in cobalt-nickel films (See Fig. 5). The mechanism by which H_c is increased may be related to the influence of ac/dc on film composition, as shown in Table II. The same effect on the H_c can be accomplished by changing the Co^{++}/Ni^{++} ratio in the Zapponi bath. Cobalt-nickel films of approximately H_c = 250 oersteds are obtained with straight dc at 100 amperes per square foot from a Zapponi Bath having increased nickel concentration (Ni^{++}/Co^{++} = 3).

The relationship of cobalt-nickel film composition to

TABLE II

THE EFFECT OF SUPERIMPOSED AC/DC ON FILM COMPOSITION AND H_c

Zapponi Bath Co^{++}/Ni^{++} = 1; pH = 5.0	**Film Composition** %Co	%Ni	H_c
100 asf; DC Deposit	90	10	100 oe.
AC:DC = 3:1	82	18	250 oe.

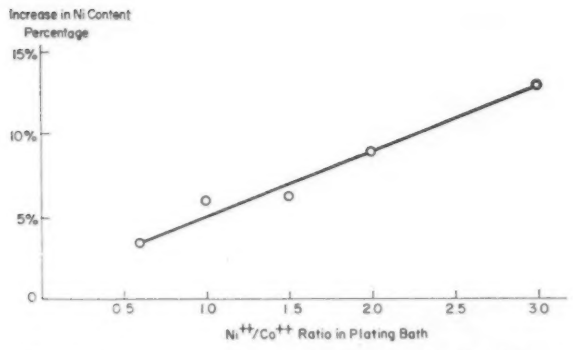


Fig. 4. Per cent increase in nickel content vs. the Ni^{++}/Co^{++} ratio in plating bath (4 mg/l of C=S added) (sulfamate bath).

squareness (B_r/B_m) and coercive force (H_c) is shown in Fig. 6 for sulfamate bath and Fig. 7 for Zapponi bath. Optimum squareness and coercive force occur within the composition region of 20 to 40 per cent nickel. However, the remanence (B_r) decreases with increasing nickel content as shown in Fig. 8 (data taken for films from sulfamate bath). Figure 9 shows the decrease in coercive force as the amount of C=S in the Zapponi bath is increased. This may be due to the increase of nickel content in the films.

Bath *p*H has a great influence on the coercive force of the films.[7, 8] Slight change in film composition as the bath *p*H is increased has been observed. However, the rapid increase in coercive force when the bath *p*H is greater than 3.5, as shown in Figs. 10 and 11, cannot be explained by the change in film composition alone. The fact that preferred crystal orientation occur in the cobalt-nickel films when bath *p*H is greater than 3.5[7, 8] appears to be related to the increase in coercive force.

4.0 CONCLUSIONS

It is known that the film composition is influenced by the plating voltage (or current density). Other factors are:

1. Co^{++}/Ni^{++} ratio in the plating bath.
2. The addition of C=S.
3. The bath *p*H.
4. Superimposed ac/dc.

All chemicals containing C=S (functional group), providing they are soluble in the plating bath, exert a marked influence

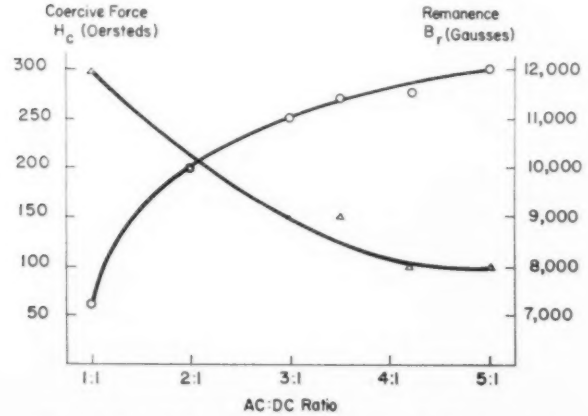


Fig. 5. B_r and H_c vs. ac/dc ratio (Zapponi bath; ac:dc=1:1 means dc plating).
Legend: O for H_c △ for B_r

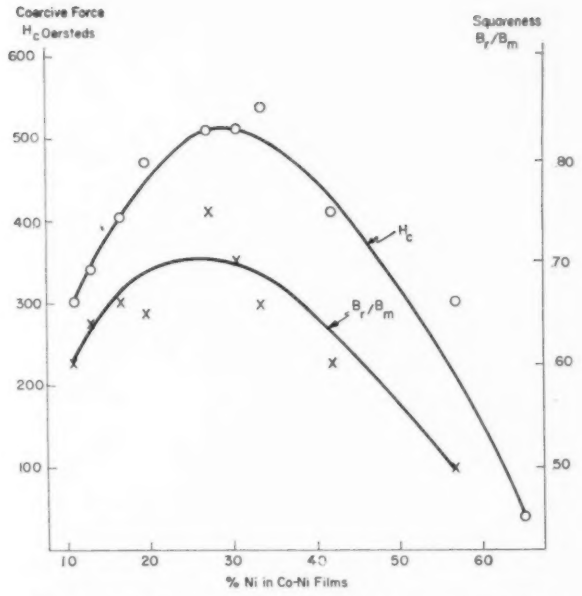


Fig. 6. Co-Ni composition vs. B_r/B_m and H_c (sulfamate bath).

on the film composition. The effect of CS_2 (S=C=S) on sulfamate bath is similar to that of KCNS, thiourea, etc. However, CS_2 failed to show any effect in the Zapponi bath. This is due to the volatile nature of CS_2 which rapidly de-

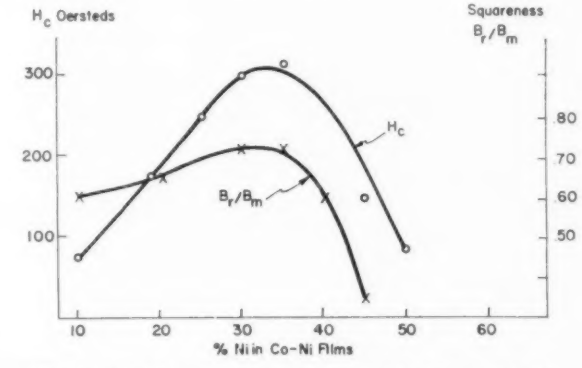


Fig. 7. Co-Ni composition vs. B_r/B_m and H_c (Zapponi bath).

creases its concentration in the Zapponi bath at the operating temperature required.

The effect of bath *p*H on the film composition is relatively small. Therefore, the pronounced influence of *p*H on the

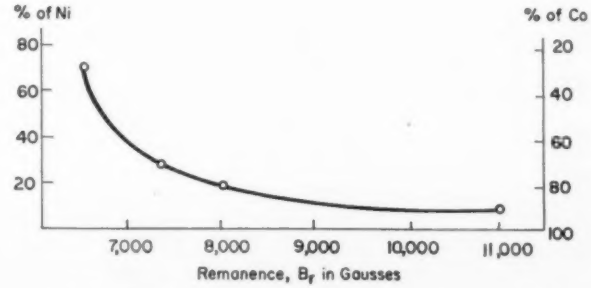


Fig. 8. Co-Ni composition vs. remanence (sulfamate bath).

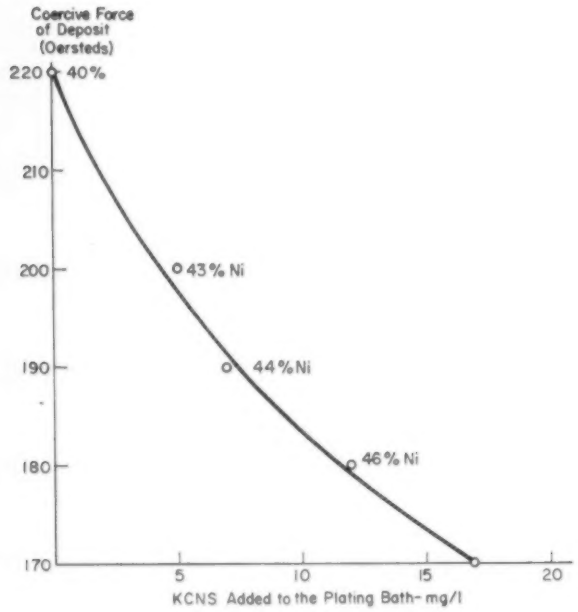


Fig. 9. Concentration of KCNS vs. coercive force (Zapponi bath).

magnetic characteristics cannot be interpreted on the basis of a change in composition.

The application of superimposed ac/dc is not the only method of obtaining a high coercive force film from the Watts type cobalt-nickel baths (Zapponi bath). A similar result can be obtained simply by increasing the nickel concentration.

Optimum magnetic properties fall within the composition region of 20 to 40 per cent nickel. The maximum coercive force is approximately 300 oersteds for films from the Zapponi bath and about 500 oersteds for films from sulfamate bath. Magnetic properties are not influenced by film composition alone. Due to factors other than film composition, the magnetic properties of films vary from bath to bath.

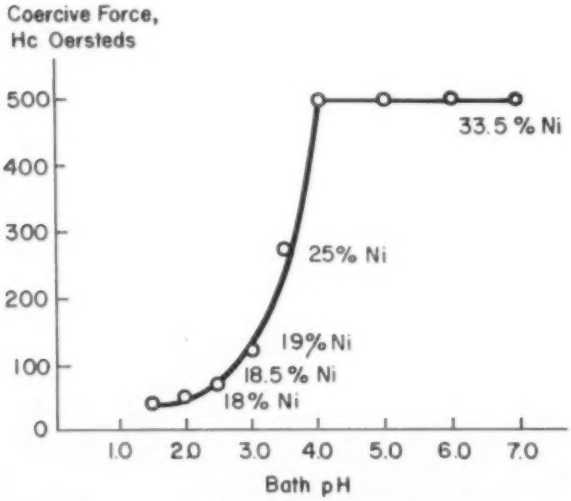


Fig. 10. Bath pH vs. coercive force (sulfamate bath).

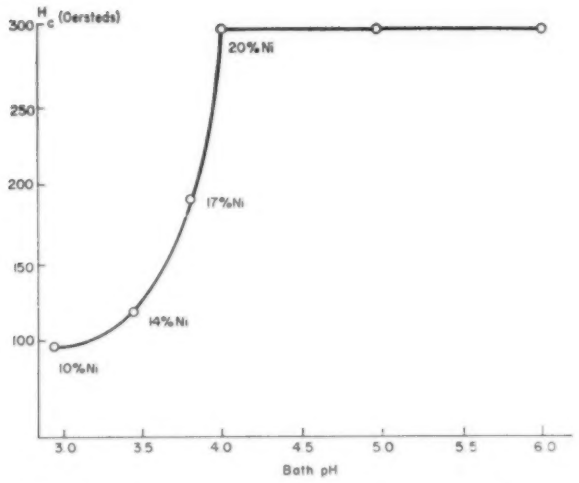


Fig. 11. Coercive force vs. pH (Zapponi bath; Co^{++}:Ni^{++} = 1:3; Current Density = 100 asf DC).

5.0 ACKNOWLEDGMENT

The technical assistance of Mr. K. Sakamoto is gratefully acknowledged, and the x-ray fluorescent studies conducted by Mr. W. F. Traber and Mr. R. K. Van Valkenburg are particularly appreciated.

6.0 REFERENCES

[1]Moline, W. E. and R. M. Clinehens, US Patent 2,730,491 (Jan. 10, 1956).

[2]Scheer, H. C. and E. R. York, US Patent 2,834,725 (Dec. 27, 1956).

[3]Zapponi, P. P., US Patent 2,619,454 (Nov. 25, 1952).

[4]Zentner, V., 47th Annual Technical Proceedings, American Electroplaters' Society, 166-169 (1960).

[5]Bonn, T. H. and D. C. Wendell Jr., US Patent 2,644,787 (July 7, 1953).

[6]Barrett, R. C., 47th Annual Technical Proceedings, American Electroplaters' Society, 173 (1960).

[7]Tsu, I., Plating, **48** No. 4, 379-381 (April, 1961).

[8]Quinn, H. F. and I. M. Croll, 9th Annual Conference on Industrial Applications of X-Ray Analysis, August, 1960.

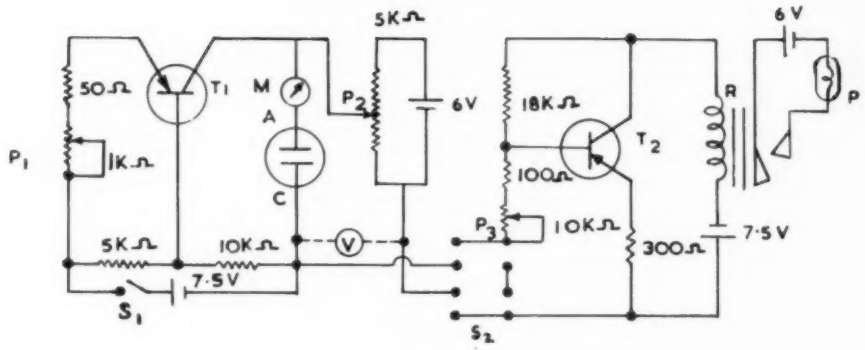
[9]Jernstedt, G. W. and M. Ceresa, US Patent 2,470,775 (May 24, 1949).

[10]Koretzky, H., IBM Technical Report, TR17.17.072.003 (Oct. 7, 1959).

[11]Tsu, I., Plating, **47**, No. 6, 632-633 (June, 1960).

[12]De Mars, R. D., J. of Electrochem. Soc., **108**, No. 8, 779-782 (1961).

Ignatius Tsu is a chemist with the File Technology, General Products Division, IBM Corporation, San Jose, California. He is engaged in research and development of electroplated magnetic materials. He received the degree of BS in chemistry from St. Mary's University in San Antonio, Texas. Mr. Tsu is a member of the American Chemical Society and the American Electroplaters' Society. He is the 1961 recipient of the AES George B. Hogaboom Memorial Nickel Plating Award, and the IBM Invention Award.



P_1 = CURRENT ADJUSTMENT. $T_1 \cdot T_2$ = OC 72 TRANSISTORS. S_1 = S.P.S.T. SWITCH FOR CURRENT.
P_2 = BALANCE ADJUSTMENT. P = INDICATOR LAMP. S_2 = D.P.D.T. SWITCH FOR AMPLIFIER INPUT.
P_3 = SENSITIVITY ADJUSTMENT. R = ELECTROMAGNETIC RELAY. M = MILLIAMMETER 0 – 10 MA.

Fig. 1. Circuit diagram.

A SIMPLE TRANSISTORIZED THICKNESSMETER FOR ELECTROPLATES

by U. H. NARAYANAN and K. R. VENKATACHALAM*

METAL ARTICLES ARE often given a coating of another metal to obtain special surface properties such as corrosion resistance. These coatings are produced by various methods the most important of which is electrodeposition. For determining the thickness of the deposit for control purposes, various methods are available such as chemical, electrolytic, mechanical, optic, microscopic, magnetic, X-ray, eddy-current, spectroscopic and radioactive methods. Each of the above methods has its own advantages and disadvantages.

The anodic stripping method appears to be very simple, reliable and can be adopted without much difficulty in any laboratory. In its simplest form,[1] it does not require any elaborate equipment. It measures the local thickness of coating over a small area rather than the average thickness of an extensive area as given by the chemical stripping methods.

In this technique a constant current is forced through the system having the specimen as anode and stainless steel as cathode using a suitable stripping solution. The property of the solution should be such that 100 per cent current efficiency is ensured for stripping and the thickness can be evaluated by applying Faraday's laws, from the time taken for dissolution of the electrodeposit. The completion of the stripping is indicated by a jump in the stripping cell potential. This sudden change in the potential after suitable amplification with a dc amplifier operates a relay that gives indication of the end-point.[2, 3] The present paper describes a simple thickness-

*Central Electrochemical Research Institute, Karaikudi, India.

meter with a built-in transistor controlled constant current generator and transistor relay.

Though there are circuits which deliver fairly constant current at varying loads such as a high voltage source with high resistance in series, or pentode circuits operated at the saturation level, it would be an advantage to have simpler circuits which employ low voltage source and deliver constant current source efficiently and quickly. For the latter type, transistor controlled power supplies offer great promise as they are capable of delivering constant high current at low voltages. The additional advantages of the transistor circuit are its long life and simple circuit design and small size. The circuit diagram is given in Fig. 1.

Among the three configurations of the transistor circuits, the grounded base configuration is adopted for the constant current source as the input resistance is low and output resistance is high. Furthermore, the grounded base network is less sensitive to temperature variations than the grounded emitter and grounded collector networks.

Commercially available germanium transistors of the type OC 72 are used. Changes in the load resistance or cell resistance from 0 to 100 ohms produced a change of less than 0.5 per cent in current output of 10 ma. The stability of the unit after a 30-sec warm-up period is better than 0.1 per cent and it is recommended that the constant current generator should be switched on at least one minute before the instrument is put into use to reduce the error to the minimum. The time constant of the current regulation is of the order of a second; almost complete restoration of the current on change of load takes place in less than five seconds. Switch S_1 is used for connecting the battery to the constant current generator and S_2 to feed the cell unbalance voltage to the relay circuit. The direct current through the cell can be varied up to 12 ma by adjusting the emitter resistance P_1. The voltage across the stripping cell can be balanced by the potentiolite P_2.

The current flowing through the balancing circuit from the constant-current generator is practically zero under the fully balanced condition. Even with an unbalance of 100 mv and 200 mv, the current flowing through the balancing circuit is less than 0.08 μa and 0.18 μa respectively. Hence, constant current delivered by the generator and indicated in the milliammeter is almost entirely passing through the stripping cell.

The maximum voltage gain of the amplifier is 80. A 50 mv signal can therefore operate the relay. The sensitivity of the amplifier-relay can be controlled by adjusting the potentiometer P_3. This control would have to set according to the needs of any particular plate-basis metal combination.

For carrying out a determination, the switch S_1 is closed and the potentiolite P_1 is adjusted to deliver the necessary current as indicated by the milliammeter M. The cell voltage as indicated by the voltmeter V is then balanced out by adjusting the potentiometer P_2. The switch S_2 is then closed thereby connecting the cell to the amplifier relay. When the dissolution of the coating is complete, the relay is operated by the jump in the voltage of the stripping cell and the indicator lamp lights which gives an indication of the end point. The set-up has been successfully used for determining the thickness of the chromium plate over copper or mild steel by using 10 per cent NaOH as stripping solution and passing a constant electrolyzing current, 8 to 10 ma. The area isolated for stripping was 0.07 cm^2.

ACKNOWLEDGMENT

The authors thank Professor K.S.G. Doss, director, Central Electrochemical Research Institute, Karaikudi, for his keen interest.

REFERENCES

[1]Mathur, P. B., Plating, **47**, November 1960, 443–445.

[2]Satyanarayana, S., and D. L. Roy, J. Sci. Indus. Res., **18A**, 75–78 (1959).

[3]Francis, H. T., Trans. Electrochem. Soc., **93**, 79 (1948).

U. H. Narayanan was born at Undi, India, in 1932. He received his BSc. degree in physics from the University of Madras and the post-graduate diploma in electronics from the Madras Institute of Technology, Madras. He is presently in charge of the Instrumentation Section of the Central Electrochemical Research Institute, Karaikudi. He is an Associate Member of the India Section of the Electrochemical Society.

K. R. Venkatachalam was born at Keelakandani, South India, in 1930. He joined the Central Electrochemical Research Institute, Karaikudi in 1955. Since then, he has been working on problems relating to electronic instrumentation as applied to electrochemistry. He is a student member of the British Institution of Radio Engineers.

EFFECT OF CLEANING METHODS UPON ELECTROCHEMICAL BEHAVIOR OF HIGH-CARBON STEEL CATHODES IN A CHROMIC ACID ELECTROLYTE*

by GEORGE CHAPLENKO**

ABSTRACT

An experiment was conducted to provide a measurable evidence in support of the widely accepted assumption that the pre-treatment procedures have a deciding effect upon the quality of subsequent plating. High-carbon steel cathodes, which are often difficult to chromium plate, were cleaned in 21 different ways, then immersed into CrO_3 electrolyte where the cathode potential was measured at various current densities. The resultant cathode potential vs current density plots were subsequently used to evaluate the relative effectiveness of individual cleaning cycles. A validity test, comprising actual test-plating of several samples, was run to establish the reliability of the evaluation.

INTRODUCTION

THE QUALITY OF ELECTRODEPOSITED metallic coatings and particularly their adhesion to the basis metal is greatly affected by the surface condition of the latter.[1, 2, 3, 4, 5, 6, 7] The surface condition, in turn, is influenced by numerous factors, such as the nature of the basis metal,[1, 9, 10] the type of heat treatment received by the part,[9, 11] the mechanical methods and techniques used in manufacturing the part, [12, 13, 14, 15] as well as the mechanical, chemical, or electrochemical pre-plating treatment.[6, 7, 8, 9, 13, 45]

The first three factors usually are selected on the basis of functional considerations and can only rarely be changed to suit a plater's purpose. The last factor, however—commonly referred to as "cleaning"—is entirely within the plater's domain and can be varied to suit specific plating conditions.

The importance of cleaning was known years ago and cleaning methods have been the subject of attention of numerous investigators.[4, 6, 7, 8, 9, 15, 16, 17, 18, 19, 20, 21, 45] Many have stressed the fact that cleaning requirements are most exacting when a metal is prepared for chromium plating.[9, 22] Cleaning becomes even more important when hardened high-carbon or carburized steel is to be chromium plated.[8, 11, 14] In the latter case, however, research was concentrated on the problem of finding a suitable pre-plating treatment for "tool chromium" rather than for "ornamental chromium" plating.

While studying various metal-cleaning techniques, most investigators employed somewhat subjective methods of evaluation of surface cleanliness, such as the atomizer test or the water-break test. In some cases, cleaning cycles were rated on the basis of a performance test, i.e., cleaned parts were plated under controlled conditions and the quality of resultant plate was the basis for evaluation of the effectiveness of the pre-plating cleaning cycle.[6, 23, 24, 45]

Several investigators of cleaning methods expressed an opinion that in the case of plating chromium over steel many seemingly unexplainable difficulties are, perhaps, due to the fact that some cleaning methods tend to lower the overvoltage of hydrogen,[10, 14, 25, 26, 27] thus reducing cathode efficiency in an unpredictable manner. It appears that in localized areas of the cathode the efficiency is sometimes reduced almost to zero.

The overvoltage lowering theory, however, is largely presented as a speculation and is seldom supported by experimental numerical data. This statement should not be read to mean that no research was devoted to hydrogen overvoltage. On the contrary, numerous papers dealing with this subject have been published.[12, 14, 19, 28, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37]

In most cases, however, authors of overvoltage papers are interested mainly in the theoretical aspect of the subject. Yet, they established that hydrogen overvoltage is affected by various factors in the following manner. The overvoltage increases with the increasing density of polarizing current and, when the current density becomes sufficiently high, it tends to approach a limiting value of about 1.32 volts.[38] At this point the magnitude of overvoltage is not dependent on the cathode material. Overvoltage varies inversely with the electrolyte temperature and decreases slightly when *p*H of the solution increases; its magnitude is affected even by traces of catalytic poisons and by the rate of H_2 diffusion through the cathode.[39] Overvoltage of hydrogen is higher when certain plating bath additives are present or when the metal ion content of the bath is lowered. When superimposed ac or chemical depolarizers are present, a lower hydrogen overvoltage is observed.[1, 46]

Overvoltage experiments described in the majority of papers were usually performed under idealized conditions. Electrodes were often made of platinum, electrolytes were saturated usually with inert gases and their concentration kept well below that commonly encountered in plating solutions. Only rarely does a researcher use an actual plating solution for an overvoltage or a polarization study.[40, 41, 42]

It is difficult, if not impossible, to extrapolate data collected under idealized conditions to those encountered within a plating tank, especially a plating tank containing chromium bath. Rather than make an attempt to correlate data from various overvoltage studies with plating room difficulties, the author decided to conduct an experiment which would show, in a measurable way, how the pre-plating treatment affects the electrodeposition of chromium on high-carbon steel. He also expected to find, as a by-product of the experiment, a simple objective method that could be used for evaluation of the relative effectiveness of metal-cleaning techniques.

A detailed description of the experimental set-up and procedure are given elsewhere in this paper. The experiment consisted of:

*Paper is based on author's thesis for Master of Science degree in Chemical Engineering at Newark College of Engineering, Newark, New Jersey.

**The Singer Manufacturing Company, Elizabeth, New Jersey.

1. Selecting several cleaning schedules, preferably resembling those used in plating industry.
2. Processing multiplicate samples in accordance with these schedules.
3. Measuring cathode potential against a reference electrode at various densities of the polarizing current.
4. Constructing a "Polarized Current vs Cathode Potential" curve for each group of samples pre-treated in accordance with one specific cleaning schedule.
5. Concluding, on the basis of shapes or relative location of current-potential curves, which cleaning schedule will most likely result in a best or in a poorest plating quality.
6. Confirming or disproving this conclusion by test comprising an actual plating of several samples treated in accordance with cleaning schedules selected in Step 5.

It should be noted here in reference to Step 1, that no acid "dips" of short duration were employed. While such dips are widely used by platers as final or activating step of a cleaning schedule, it was felt that they would be difficult to duplicate and thus would only contribute to ambiguity. Similarly, no wetting agent was used in water rinses. There are indications that the presence of certain organic substances in an electrolyte has a tendency to cause variations in hydrogen overvoltage;[32] it was feared that wetting agents, when dragged into the electrolysis cell, might produce a similar effect.

Essentially, all overvoltage studies employ modifications of but two basic methods, namely, the direct method and the commutator method of measurement. When the former is used, both the reference electrode and the polarizing current source are tied permanently to the electrode being investigated; the potential of this electrode is measured while the current is on. In the latter method, a provision is made to connect reference electrode to the electrode being investigated only when the polarizing current is switched off. The relative merits of both methods are discussed at length in literature,[1, 36, 38, 39, 42, 43, 44] but it seems that in the hands of skilled investigator either method is capable of producing satisfactory results—at least, when used in conjunction with a low-concentration electrolyte.

For the present work, the direct method of measurement was selected as a matter of convenience. A trial run of a mechanical commutator revealed that meter reading is greatly influenced by the conditions of the commutator surfaces, as well as by the fluctuations in the switching rate. The use of an electronic switching device would, of course, eliminate both factors, but would also complicate the instrumentation unnecessarily.

The simple Haring's method,[33] based on the use of a reference electrode made of the same material as the electrode being investigated, was very attractive. However, only a mild attempt was made to utilize this approach. It was felt that, although the overvoltage calculated for various samples would always be the difference of potential between the polarized and the non-polarized metal, the comparison of overvoltages of samples cleaned by different methods would not be valid. Later in the experiment, this assumption was confirmed. The uniformity of the sample surface conditions varied within every group of multiplicate samples, the magnitude of these variations being dependent upon the cleaning schedule employed.

Haring's method was abandoned in favor of a direct method designed around a saturated calomel reference electrode and a vacuum-tube voltmeter. The latter instrument, rather than the more conventional potentiometer, was selected for the following reasons. It is commonly assumed that a potentiometer or a bridge circuit draws no current from the circuit under measurement. This is, however, true only after the circuit is brought to balance. The necessary "tapping" during the balancing operation causes a small and indeterminable current draw which might or might not have an effect upon the results of the measurement. A sensitive potentiometer would also indicate potential changes as small as one millivolt and thus its readings might reflect even the random fluctuation of the potential. On the other hand, a vacuum-tube voltmeter with its inherently high input resistance (upward from 10–20 megohms) draws a constant but small current, and would effect all measurements to the same degree. A vacuum-tube voltmeter of the type used in this experiment cannot be read closer than 10–20 mv and thus, being a relatively "blunt" instrument, reacts only to permanent changes in the electrode potential.

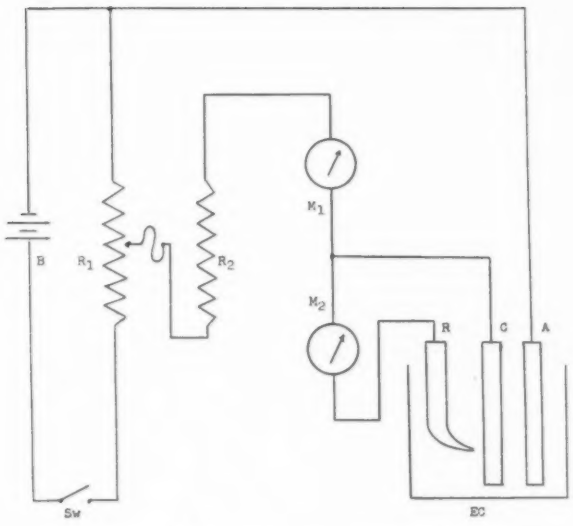
The final selection of the procedure and of electrolytes to be used in conducting the experiment was made on a basis of preliminary trial tests, or on the basis of certain considerations explained below.

A. Speed of Agitation

Various stirrer speeds, from zero speed (no agitation) to the maximum speed obtainable with the available motor, were tried. It was found that when no agitation or only a slow-speed agitation were employed, the potential stabilization occurred rather slowly and that the reproducibility of readings was poor. On the other hand, when the stirrer was run at a maximum speed, too much splashing was observed and the electrolyte was visibly aerated. Splashing covered the electrode carrier arm with a film of electrolyte and this created a current leakage path and a possibility of erroneous readings. The medium stirrer speed (approx. 100 rpm) was, therefore, selected as the standard agitation. This was fast enough to provide a noticeable flow of electrolyte past the cathode, yet did not cause undue splashing or aeration.

B. Calomel Electrode

Several methods of connecting the calomel electrode to the electrolysis cell were tried. In each case, electrode was surrounded with a KCl-filled glass jacket (see Fig. 5) which was drawn to a capillary tip. When the top of jacket was tightly closed with a greased rubber stopper, the level of KCl solution within remained constant. It was noted, however, that as soon as the tip of the jacket touched surface of the CrO_3 electrolyte, the latter would diffuse upward into the KCl at an amazingly fast rate. A cotton plus, inserted into the capillary, failed to completely stop this diffusion. Finally, the diffusion of the CrO_3 solution was counterbalanced by a controlled bleeding of the KCl solution from the capillary tip of the jacket. However, potential of the cathode measured with this arrangement proved to vary in an unpredictable fashion, and at higher densities of the polarizing current a chlorine odor began to emanate from the electrolysis cell. Samples, when removed from the solution, were also found to have this odor. Evidently, the effluent KCl was being decomposed and was causing fluctuations of the potential. Since the bleeding method of stopping diffusion of the CrO_3 could not be used, several more attempts to use cotton and asbestos plugs were made. These were finally replaced by a plug made from gelatin containing about 5 per cent of KCl. The gelatin plug proved to be most satisfactory and completely stopped the diffusion of CrO_3 into the KCl solution.



B - battery, 12 v
R_1- potentiometer, 1,000Ω , 2 w
R_2- resistor, 150Ω , 2 w
Sw- on-off switch, S.P.S.T.
M_1- milliammeter
M_2- vacuum tube voltmeter
EC- electrolysis cell
R - reference electrode
C - cathode
A - anode

Fig. 1. Polarizing circuit.

C. Concentration of the Electrolyte

The ease of handling of the experimental setup was tested with NaCl and KCl electrolytes of various concentrations; the cathode potential readings were not recorded. Since the decision was made beforehand that the experiment was to be run with CR-110, a commercial chromium plating formulation, this was tested in four concentrations: full-strength and diluted to be approximately 1.0 M, 0.1 M, and 0.01 M in CrO_3. While all of these performed satisfactorily, the undiluted solution (about 250 g/l of CrO_3) was too opaque to permit a visual examination of the surface of submerged electrodes. The 0.01 M solution was, of course, the most transparent, but its limitation was the possibility of concentration changes occurring during a lengthy electrolysis run. The 1.0 M solution was finally made standard for the experiment. When sidelighted, it was transparent enough to permit the observation of electrode surfaces; yet, its concentration was close to that of the full-strength solution and, therefore, readings obtained with 1.0 M solution should be comparable to results of measurements on a full-strength electrolyte.

D. Cleaning Solutions

An extremely large variety of metal-cleaning formulas is used by the plating industry. Since they all fall into essentially two categories, i.e., alkaline solutions used with or without current, and acid solutions used with or without current, it was not too difficult to select a typical alkaline soak-cleaning and electro-cleaning formula, as well as two acid pickles. For the acid pickles, HCl and H_2SO_4 were selected because they are used by almost every plating shop. The use of an acid electro-cleaning bath was considered, but decided against. In many instances, this type of cleaning produces a rather deep etch which improves adhesion but not the appearance of the deposit. Cleaning formulations containing ions of non-alkali metals (such as formula used in the Bullard-Dunn or other strike cleaning processes) were not taken into consideration. These are used cathodically and therefore potential readings would, naturally, be influenced by the type and amount of metal deposited on the cathode while it was being cleaned.

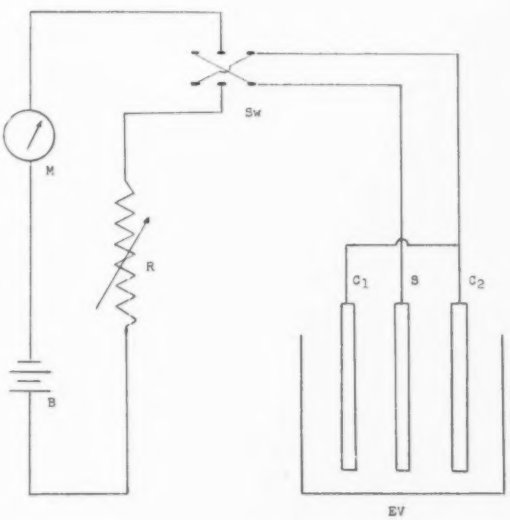
In all cases, including the trial runs, the electrolysis was conducted with low-carbon steel anodes (rather than with lead anodes) since the steel anodes were easier to prepare in such a way that the initial cathode-anode emf was reasonably close to zero. A new anode was used for each cathode sample and the anode area was adjusted to 250 mm², i.e., about three times that of the apparent area of the cathode.

Sample cathodes used during the experiment were taken at random from a large (several thousand pieces) production lot, immediately after the tempering operation. Physically, samples were small pins, 1.8 mm in diameter, 30 mm long, with one end stamped flat. This shape permitted an easy insertion into the cathode holder, which was provided with a centrally-located 1.9 mm bore and a slot to accommodate the flat end of specimen (see Fig. 4). Pins were manufactured from 1.3 per cent carbon steel and heat treated to a hardness of Rockwell C 60.

The temperature of the electrolysis cell was not thermostatically controlled, but the environment of the experiment was such that the cell temperature remained at 18± 1C during the experiment. The emf for the polarization of samples was obtained from a potentiometer placed across two 6v Eveready dry cells, connected in series. A 6-volt storage battery was used as the current source for electro-cleaning and stripping of samples.

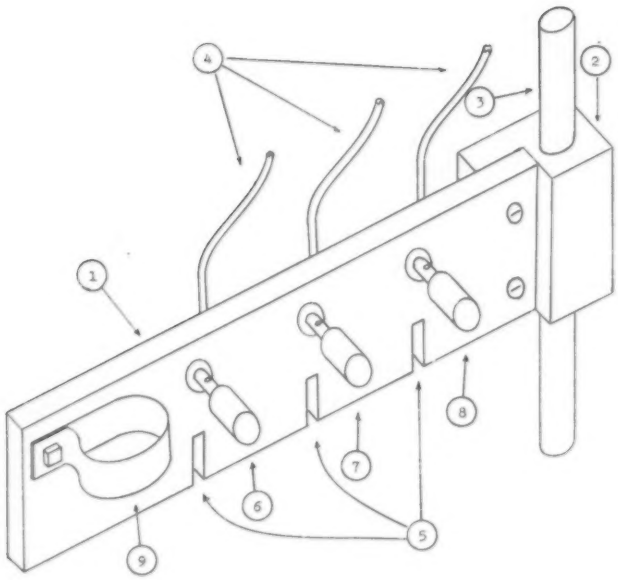
EXPERIMENTAL PROCEDURE

1. Assemble the polarizing and the electrocleaning circuits in accordance with schematics shown, respectively, in Figs. 1 and 2.



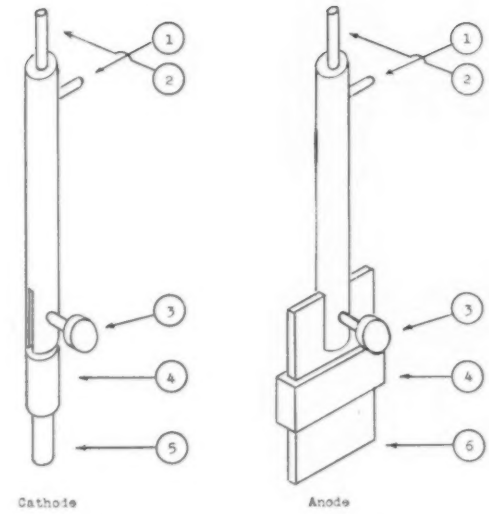
B - battery, 6 v
R - rheostat, 600Ω , 2 w
M - milliammeter
Sw - on-off and polarity reversing switch, D.P.D.T.
EV - electrolyte vessel
S - sample to be cleaned
C_1, C_2 - counter-electrodes

Fig. 2. Electrolytic cleaning circuit.



1 - carrier arm, plexiglass
2 - support clamp, aluminum
3 - support rod, aluminum
4 - flexible leads
5 - locating slots
6 - cathode terminal and clamp
7 - anode terminal and clamp
8 - reference electrode terminal
9 - reference electrode clamp

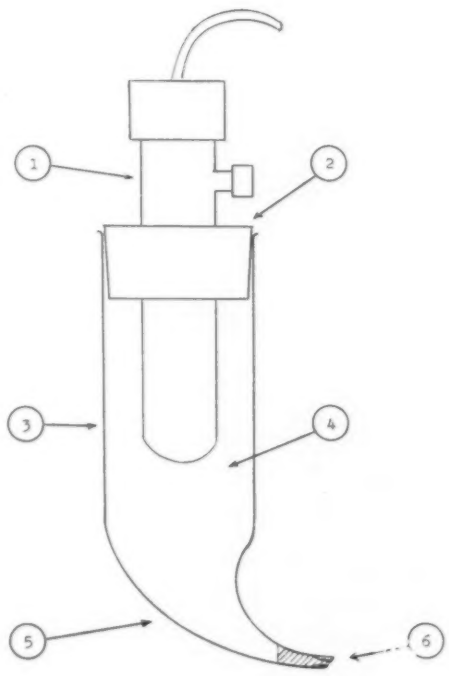
Fig. 3. Electrode carrier.



1 - locating pin
2 - terminal pin
3 - set screw
4 - stop-off sleeve, PVC
5 - sample
6 - anode plate

Fig. 4. Electrode holders.

2. Prepare electrolysis cell by filling it with electrolyte and by placing the reference electrode assembly (Fig. 5) and the loaded anode holder (Fig. 4) into their respective clamps on the electrode carrier arm (Fig. 3). The arm should be in its topmost position and the anode should be stopped off with PVC so that only its lower 13mm portion is exposed.
3. Insert a sample into the cathode holder (Fig. 4) and stop it off leaving only the lower 13mm portion exposed. Process sample in accordance with one of the cleaning schedules then transfer the cathode holder to the electrode carrier arm, making sure that the locating pin of the holder enters the appropriate slot at the arm.
4. Place electrodes into the electrolyte by lowering the electrode carrier. Start the stirrer.
5. Switch on the polarizing current and adjust it, in sequence, to 0.0, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 45.0, and 50.0 mA. Allow the current to stabilize at each level, then take and record the cathode potential in mV.
6. Repeat steps 3 through 5 until a triplicate run is made for every cleaning schedule listed.
7. Plot "Polarizing Current vs Cathode Potential" curves and, on the basis of their appearance, select two most distant curves and one approximately mid-way between them.
8. Confirm selection by running a validity test, comprising plating of triplicate samples cleaned in accordance with schedules corresponding to above selected curves and then comparing the thickness and the appearance of the resultant plates.



1 - sat. calomel electrode
2 - rubber stopper
3 - glass jacket
4 - sat. KCl solution
5 - bridge arm, plugged
6 - capillary tip

Fig. 5. Reference electrode assembly.

TABLE I

EFFECT OF CLEANING PROCEDURE UPON THE CATHODE POTENTIAL

Cathode Potential, mv

Polariz. current, ma	Cathode current density ma/sq in	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21
0.0	0.0	+445	+347	+458	+368	+457	+296	+293	+312	+202	+288	+268	+265	+227	+245	+233	+78	+222	+323	+210	+173	+177
0.5	4.4	+305	+248	+370	+322	+280	+252	+240	+257	−25	+234	+133	+132	+45	+192	+105	−152	+15	+277	+28	−83	−78
1.0	8.8	+273	+210	+327	+248	−65	+225	+202	+200	−170	+208	−28	−25	−25	+152	+32	−223	−82	+252	−57	−156	−168
2.0	17.6	+115	+43	+310	+168	−488	+175	+138	+118	−447	+160	−28	−270	−127	−73	−103	−720	−365	+205	−200	−245	−418
3.0	26.4	−53	−468	+298	+85	−540	+222	−95	−43	−687	+83	−478	−344	−503	−113	−515	−712	−568	+135	−488	−743	−737
4.0	35.2	−375	−468	+280	−240	−660	+288	−107	−73	−638	−163	−490	−592	−542	−115	−448	−700	−760	−27	−638	−685	−705
5.0	44.0	−495	−512	+267	−417	−660	−428	−118	−88	−638	−192	−728	−588	−678	−165	−462	−705	−717	−77	−635	−687	−708
6.0	52.8	−738	−770	+248	−396	−643	−437	−137	−103	−635	−238	−712	−590	−678	−207	−473	−710	−710	−245	−635	−687	−708
8.0	70.4	−787	−795	+203	−415	−657	−405	−172	−136	−650	−470	−728	−615	−698	−450	−550	−728	−722	−722	−642	−700	−723
10.0	88.0	−763	−837	+170	−457	−673	−415	−208	−163	−657	−766	−737	−622	−710	−466	−730	−735	−725	−705	−648	−705	−725
15.0	132.0	−815	−832	−147	−790	−707	−427	−565	−410	−682	−797	−795	−660	−758	−475	−690	−767	−750	−723	−663	−727	−753
20.0	176.0	−837	−825	−240	−780	−737	−427	−782	−503	−708	−830	−862	−695	−773	−518	−708	−790	−723	−742	−683	−745	−778
25.0	220.0	−815	−860	−540	−798	−773	−460	−712	−733	−680	−706	−835	−743	−787	−823	−732	−817	−727	−758	−707	−768	−807
30.0	264.0	−823	−882	−845	−818	−825	−515	−732	−778	−672	−717	−745	−775	−750	−828	−755	−832	−742	−788	−733	−805	−838
35.0	308.0	−995	−1232	−912	−1350	−1005	−782	−857	−1158	−738	−878	−800	−792	−750	−1170	−978	−1040	−765	−817	−775	−853	−895
40.0	352.0	−1205	−1422	−1343	−1382	−1153	−1163	−1233	−1407	−968	−1153	−947	−1090	−750	−1195	−1182	−1393	−975	−945	−988	−912	−1012
45.0	396.0	−1402	−1433	−1395	−1402	−1352	−1202	−1428	−1437	−1205	−1382	−1132	−1150	−1095	−1215	−1413	−1413	−1037	−1097	−1120	−990	−1073
50.0	440.0	−1415	−1438	—	−1415	−1373	−1423	−1445	−1452	−1417	−1413	−1340	−1208	−1140	−1430	−1430	−1425	−1403	−1325	−1371	−1183	−1208

*Each potential reading is an average of three determinations.

CLEANING SCHEDULES

Cycle No.	Description of Cycle
1	Sample polished with dry sandpaper; solvent degreased.
2	Sample polished with dry sandpaper; solvent degreased; wet-scoured; rinsed.
3	Sample polished with dry sandpaper; solvent degreased; soaked in alkaline cleaner; rinsed.
4	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed.
5	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed.
6	Sample polished with dry sandpaper; solvent degreased; pickled in HCl; rinsed.
7	Sample polished with dry sandpaper; solvent degreased; alkali soak-cleaned; rinsed; pickled in HCl; rinsed.
8	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in HCl; rinsed.
9	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in HCl; rinsed.
10	Sample polished with dry sandpaper; solvent degreased; pickled in H_2SO_4; rinsed.
11	Sample polished with dry sandpaper; solvent degreased; alkali soak-cleaned; rinsed; pickled in H_2SO_4; rinsed.
12	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in H_2SO_4; rinsed.
13	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in H_2SO_4; rinsed.
14	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in HCl; rinsed; electrocleaned cathodically; rinsed; pickled in HCl; rinsed.
15	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in HCl; rinsed; electrocleaned cathodically; rinsed; pickled in HCl; rinsed.
16	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in HCl; rinsed; electrocleaned anodically; rinsed; pickled in HCl; rinsed.
17	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in HCl; rinsed; electrocleaned anodically; rinsed; pickled in HCl; rinsed.
18	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in HCl; rinsed; electrocleaned cathodically; rinsed; pickled in H_2SO_4; rinsed.
19	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in HCl; rinsed; electrocleaned cathodically; rinsed; pickled in H_2SO_4; rinsed.
20	Sample polished with dry sandpaper; solvent degreased; electrocleaned cathodically; rinsed; pickled in HCl; rinsed; electrocleaned anodically; rinsed; pickled in H_2SO_4; rinsed.
21	Sample polished with dry sandpaper; solvent degreased; electrocleaned anodically; rinsed; pickled in HCl; rinsed; electrocleaned anodically; rinsed; pickled in H_2SO_4; rinsed.

DETAILS OF INDIVIDUAL STEPS USED IN PREPARATION OF SAMPLES

1. Sandpaper polishing.
   Samples were rubbed (lengthwise and circumferentially) with Carborundum Co.'s Extra Fine Indian Head flint paper, until a uniform luster was obtained.
2. Solvent degreasing.
   Samples were agitated in 1,1,1,-trichloroethane for 30 seconds; excess solvent was shaken off and samples were air-dried before next step.
3. Alkaline soak cleaning.
   Samples were immersed for two minutes into the following bath:

Caustic Soda	16 g/l
Sodium Metasilicate	8 g/l
Sodium Carbonate	8 g/l

Trisodium Phosphate ..... 8 g/l
(Operating temperature: 70 to 85C)

4. Electrocleaning.
   Both the cathodic and the anodic electrocleaning were performed by treating samples for two minutes in a bath of the following composition:
   Caustic Soda ..... 75 g/l
   Trisodium Phosphate ..... 10 g/l
   Sodium Carbonate ..... 14 g/l
   Operating Conditions:
   Counter-electrodes ..... low-carbon steel
   Temperature ..... 70 to 85C
   Current density (at the sample) ..... 100 asf
5. Hydrochloric acid pickling.
   Samples were kept for three minutes in a bath made by mixing one volume of commercial muriatic acid with two volumes of water. Bath was used at room temperature, without agitation.
6. Sulfuric acid pickling.
   Samples were kept for three minutes in a bath made by mixing one volume of commercial concentrated H_2SO_4 with four volumes of water. Bath was used at room temperature, without agitation.
7. Wet scouring.
   This operation was performed by rubbing samples for 30 to 60 seconds with a wet cloth pad, dipped into a household scouring powder ("Ajax"). Excess powder was flushed off with tap water before the sample was subjected to the rinsing operation proper.
8. Rinsing.
   A three-stage rinse was employed. The first two stages comprised tap water, but distilled water was used in the final rinse. In all cases, samples were rinsed for 30 seconds, with a continuous agitation.

APPARATUS

1. Modified* EICO Model 214 vacuum-tube voltmeter, 22 megohm input resistance.
2. Lafayette Model 30-A volt-ohmmeter, 20,000 ohms per volt.
3. Saturated calomel electrode, Beckman.
4. Stirrer assembly, consisting of a three-speed motor, a flexible shaft, and a loop impeller.
5. Dry cells, 6 volt Eveready Heavy Duty No. 509.
6. Storage battery, 6 volt, 70 ampere-hours Allstate No. 57.
7. Electrical connectors: plugs, wires, terminal posts, alligator clips, switches.
8. Potentiometer—1000 ohm, 2 watt; resistor—150 ohm, 2 watt; rheostat—600 ohm, 2 watt.
9. Electric hot plate.
10. Polyvinyl chloride tubing and stop-off tape.
11. Chemicals: NaOH, Na_2CO_3, Na_2SiO_3, Na_3PO_4, HCl, H_2SO_4, 1,1,1-trichloroethane, distilled water, CR-110 (a self-regulating chromium plating compound, made by the United Chromium Co.).
12. High-carbon steel samples.
13. Low-carbon steel strip for anodes.

DISCUSSION

When graphs of the cathode potential called for in step 7 of the experimental procedure were constructed, they proved to be too complicated to be used for evaluation of data. In order to facilitate the comparison between the shapes of all plot curves, data were re-plotted in groups of four curves, each containing a reference curve depicting potential readings on wet-scoured samples.

All charts indicated that the shape of cathode potential plots varies in a seemingly random manner. The fluctuations in the lower (0 to 10 mA) and, possibly, the middle (10 to 25 mA) current density region may represent various stages of sample surface conditioning by polarizing current. The difference between individual curves begins to become noticeable in the upper (25 to 50 mA) current density region, and especially above the topmost inflection point.

*The modification comprised:
1. Expanding the lowest available "dc volts" scale by a factor of two.
2. Building into the meter a solenoid-actuated chopper bar for arresting pointer at regular intervals to facilitate the reading of a fluctuating voltage.

Charts also show that in all cases the reference curve (cleaning schedule No. 2, wet-scoured pins) seems to be characterized by the most negative potential. The cleaning curve corresponding to cleaning schedule No. 13, (specimens cleaned anodically, then pickled in H_2SO_4) seems, on the other hand, to be the least negative. Curve corresponding to cleaning cycle No. 6 falls somewhere between these two curves, but is closer to the H_2SO_4 than to the reference curve. The three curves are shown in juxtaposition on Fig. 6, where shaded region indicates area occupied by all 21 current-potential curves.

To interpret the meaning of the difference in the relative position and shape of the above-described curves, a validity test was conducted. The test also served to check the initial assumption that the shape and the relative position of cathode potential curves will reflect the relative effectiveness of various cleaning schedules and thus might be used as a basis for predicting the quality of subsequent electrodeposits. The test comprised actual plating of samples cleaned in accordance with schedules No. 2, No. 6, and No. 13, and taking thickness measurements on the resultant electrodeposit. The appearance of plate was also noted, but its adhesion to the basis metal was not tested.

Results of this test are tabulated in Table II. The appearance of all samples was approximately the same, except that the samples cleaned in accordance with schedule No. 13 were, possibly, somewhat duller than the rest of test pieces. When used in conjunction with charts showing pertinent curves, validity test data provide a definite confirmation of the original assumption. The quality of the deposit seems to be directly correlated with the behavior of corresponding potential-current density curves.

CONCLUSIONS

As stated in preceding parts of this paper, the purpose of the experiment was to investigate the dependency between specific metal-cleaning methods and a measurable parameter which is influenced by changes on metal surfaces that are caused by cleaning. On the basis of experimental findings, an objective test procedure suitable for evaluation of the

TABLE II
VALIDITY TEST DATA

Sample preparation	Cleaning cycle number		
	2	6	13
Sample No. 1			
Weight plated, g	0.5887	0.5855	0.5873
Weight stripped, g	0.5877	0.5841	0.5868
Weight of Cr, g	0.0010	0.0014	0.0005
Sample No. 2			
Weight plated, g	0.5870	0.5880	0.5901
Weight stripped, g	0.5855	0.5872	0.5897
Weight of Cr, g	0.0015	0.0008	0.0004
Sample No. 3			
Weight plated, g	0.5899	0.5897	0.5904
Weight stripped, g	0.5888	0.5887	0.5894
Weight of Cr, g	0.0011	0.0010	0.0010
Average weight of Cr on three samples, g	0.0012	0.0011	0.0006
Average thickness of Cr on three samples, mm	0.0227	0.0203	0.0119

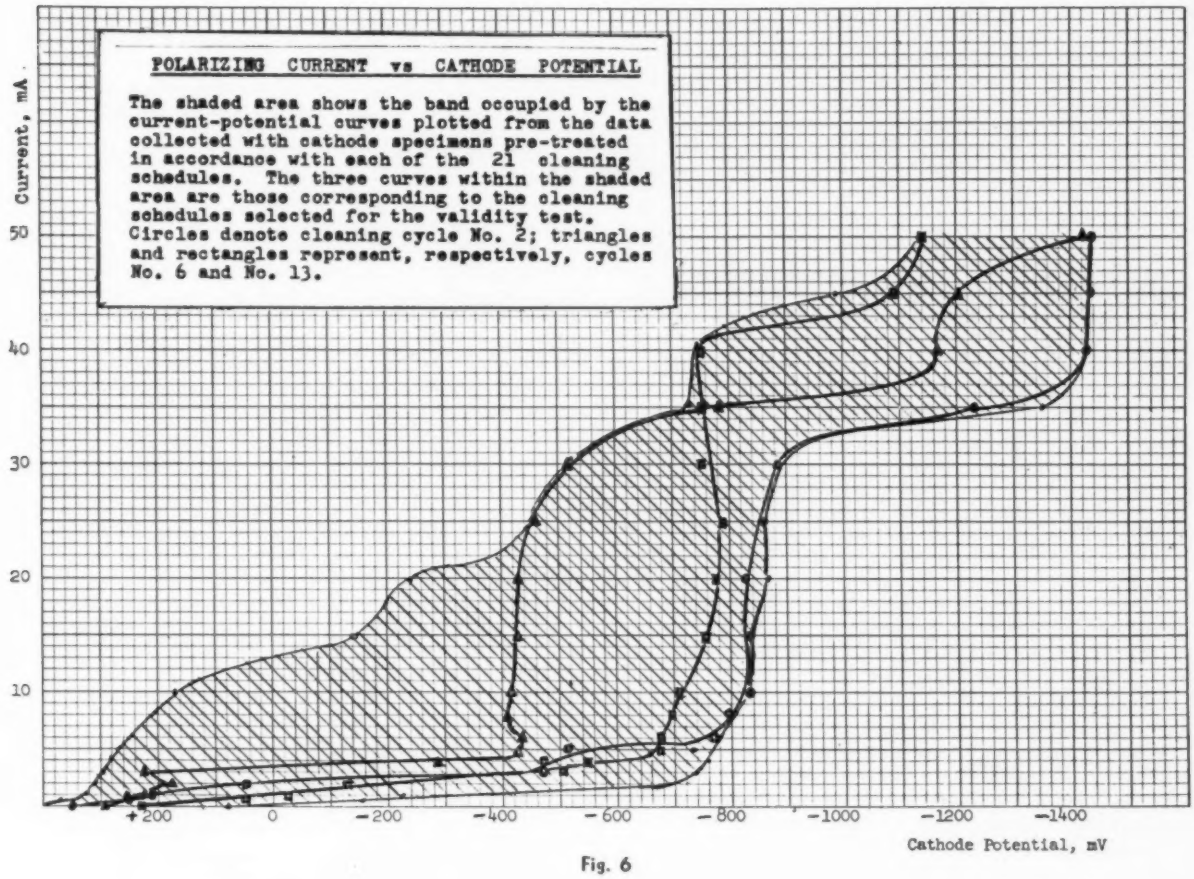

POLARIZING CURRENT vs CATHODE POTENTIAL
The shaded area shows the band occupied by the current-potential curves plotted from the data collected with cathode specimens pre-treated in accordance with each of the 21 cleaning schedules. The three curves within the shaded area are those corresponding to the cleaning schedules selected for the validity test. Circles denote cleaning cycle No. 2; triangles and rectangles represent, respectively, cycles No. 6 and No. 13.
Current, mA
50
40
30
20
10
+200
0
−200
−400
−600
−800
−1000
−1200
−1400
Cathode Potential, mV

Fig. 6

relative effectiveness was to be proposed. The results of the experiment, as tabulated and discussed above, warrant the following conclusions.

1. The quality of an electrodeposited coating and the ease of deposition are influenced by methods used in preparing the basis metal for plating. For a specific basis metal, there is a direct correlation between the quality of the deposit and the cleaning method used.

2. The single-electrode potential of the cleaned basis metal is one of the measurable parameters that can be used in evaluating the relative effectiveness of several cleaning methods, or in predicting the quality of the subsequent electrodeposit. The numerical values of this potential become meaningful only when tied in with corresponding densities of polarizing current, viz., when used in plotting potential vs. current density curves. When two individual cleaning methods are being compared, the method which, for a given current density, causes metal to acquire a more negative potential will most likely produce an easier-to-plate surface.

3. When plating chromium over polished and hardened high-carbon steel, the steel surface should preferably be prepared by mechanical cleaning, i.e., by wet-scouring with a mildly abrasive slurry. When mechanical cleaning is not feasible, the metal might be cleaned by degreasing followed by pickling in dilute HCl. In this case, the quality of plating will be comparable to, but not quite as good as, the plating obtained on a mechanically-cleaned surface. The use of H_2SO_4 pickle, especially in a final step of cleaning cycle, should be avoided since it is likely to produce an unsatisfactory plate.

Techniques employed in the course of this experiment might be adapted to produce an instrumental method for the evaluation of effectiveness of cleaning procedures. The evaluation would be on a strictly relative basis and, therefore, at least two different cleaning procedures should be tested simultaneously. Such test might be conducted as follows.

1. Obtain several specimen parts from the lot to be plated.
2. Working with one part at a time, clean the surface of the metal using one of the cleaning methods to be evaluated. Immediately after the last cleaning step, make the part the cathode in an electrolyte which is similar to that in the plating tank.
3. Measure single-electrode potential of the specimen at several densities of polarizing current, ranging from zero cd to a cd only slightly lower than that required for plating.
4. Repeat steps 2 and 3 to obtain multiplicate readings for all cleaning methods. Average each set of multiplicate values.
5. Plot potential vs. current density curves for all cleaning cycles. Visually, compare relative positions of these curves; a curve that is more negative than the others will correspond to the most efficient cleaning cycle.

The above procedure is, of course, too cumbersome for a practical at-the-tank application and its potential users will have to develop their own short-cut methods.

ACKNOWLEDGMENT

The author wishes to express his thanks to Dr. C. L. Mantell of the Newark College of Engineering for his advice on experimentation and on evaluation of results, and to Mr. D. A. Adams, Chief Metallurgist of The Singer Manufacturing Co., for providing the technical basis for the experimental work.

REFERENCES

[1]Perry, John H., ed., Chemical Engineers' Handbook, 3rd ed., McGraw-Hill, New York, 1950.

[2]Bakhvalov, G. T. et al., Spravochnik Galvanostega, 2nd ed., Moskow, 1954.

[3]Blum, William, George B. Hogaboom, Principles of Electroplating and Electroforming, 3rd ed., McGraw, New York, 1949.

[4]Rominski, R. J., F. L. Clifton, "Rinsing for Electroplating," Proceedings, Am. Electropl. Soc., **38,** 37, (1951).

[5]Mathers, F. C., L. I. Gilbertson, "The Adherence of Thick Silver Plate on Steel. I." Trans. Electroch. Soc., **74,** 287 (1938).

[6]Lyons, Jr., Ernest H., "The Contamination and Cleaning of Cold-Rolled Steel," Trans. Electroch. Soc., **80,** 367 (1941).

[7]Lyons, Ernest H., "What is a 'Clean' Surface?", Trans. Electroch. Soc., **88,** 281, (1945).

[8]Willink, A., "Chromium Plating on Steel for Wear Resistance," Trans. Electroch. Soc., **61,** 317 (1932).

[9]Graham, A. K., ed., Electroplating Engineering Handbook, Reinhold Publishing Corp., New York, 1955.

[10]Lukens, Hiram S., "Influence of the Cathode on the Electrodeposition of Chromium," Trans. Electroch. Soc., **53,** 491, (1928).

[11]Logozzo, Arthur W., "Preparation of Surfaces for Hard Chromium Plating," Proceedings, Am. Electropl. Soc., **30,** 33 (1942).

[12]Kumai, Toshihiko, "Hydrogen Overvoltages of Electropolished Surfaces," Bull. Yamagata Univer., **4,** 351, (1958).

[13]Mikhailov, A. A., "Change in Properties of Chromium Coating After Mechanical Working," Teoriya i Praktika Electrolit. Khromirovaniya, Akad. Nauk SSSR, Moskow, 1957.

[14]Murtazayev, A. M., Yu. Belopukhov, "Electrochemical Behavior of Some Steels in Caustic Solutions and the Effect of Nitriding Thereon," Trudy Sredneasiat. Gosudarst. Univer. im. Lenina, Khim., **84,** 75, 10, (1958).

[15]Greenaway, H. T., "The Electrodeposition and Refining of High-Grade Chromium," Journal Inst. of Metals, **83,** 121, (1954–55).

[16]Cuthbertson, J. B., "Electrolytic Processes for Surface Conditioning of Metals," Proc. Inst. EE., **102A,** 501, 10 (1955).

[17]Hoare, J. P., S. Schuldiner, "Hydrogen Overvolteges on Bright Iridium and Rhodium," Journal Chem. Phys., **25,** 786, 10 (1956).

[18]Baker, E. M., E. E. Pettibone, "Steel Anodes for Chromium Plating," Trans. Electroch. Soc., **54,** 331, (1928).

[19]Makrides, A. C., M. T. Coltharp, "Preparation of Solid Electrodes for H-Overpotential Studies," Electroch. Soc. Journal, **107,** 472, (1960).

[20]Linford, Henry B., David O. Feder, "Cleaning and Preparation of Metals for Electroplating. VIII. Effect of Oxide Films," Plating, **41,** 279, 397 (1954).

[21]Graham, A. Kenneth, "Faraday's Laws Applied to Cleaning," Proceedings, Am. Electropl. Soc., **47,** 41, (1960).

[22]Udy, Marvin J., ed., Chromium, vol. 2, Reinhold Publishing Corporation, New York, 1956.

[23]Harris, Jay C., "Chemical Evaluation and Control in Metal Cleaning," Proceedings, Am. Electropl. Soc., **28,** 59 (1940).

[24]Rogers, Raymond R., "Alkaline Anodic Pickling of High-Speed Steel," Trans. Electroch. Soc., **65,** 357 (1934).

[25]Sully, A. H., Chromium, Academic Press, New York, 1954.

[26]Hunt, Hershel, Joseph F. Chittum, H. W. Ritchey, "Overvoltage," Trans. Electroch. Soc., **73,** 315, (1938).

[27]Crosby, H. Lance, L. I. Gilbertson, "The Adherence of Thick Silver Plate on Steel," Trans. Electroch. Soc., **82,** 101 (1942).

[28]Stern, M., "Electrochemical Behavior, Including Hydrogen Overvoltage of Iron in Acid Environments," Journal Electrochem. Society, **102,** 609, 11 (1955).

[29]Stern, M., "Effect of Alloying Elements in Iron on Hydrogen Overvoltage and Corrosion Rate in Acid Environments," Journal Electrochem. Society, **102,** 663, 12 (1955).

[30]Ruetschi, P., P. Delahay, "Hydrogen Overvoltage and Electrode Material," Journal Chem. Phys., **23,** 195, 1 (1955).

[31]Popkov, A. P., V. M. Gevorkyan, A. T. Vagramyan, "Overvoltage in the Electrodeposition of Antimony," Izvestia Akad. Nauk SSSR, 1310–14 (1958).

[32]Ferguson, A. L., "Polarization of Electrodes in Electroplating Process," Proceedings, Am. Electropl. Soc., **33,** 215, (1946).

[33]Haring, H. E., "A Simple Method for Measuring Polarization and Resistivity," Trans. Electroch. Soc., **49,** 417, (1926).

[34]Thompson, de Kay M., D. M. Fleming, "The Hydrogen Overvoltages of Iron-Chromium Alloys in Potassium Hydroxide Solutions," Trans. Electroch. Soc., **65,** 221, (1934).

[35]Butts, Allison, W. A. Johnson, "Studies of Overvoltage; the Fusion of the Cathode and the Effect of Temperature on Gas Polarization," Trans. Electroch. Soc., **70,** 259, (1936).

[36]Boulach, A. A., "A Direct Method of Determining the Polarization Voltage Using a Rotating Electrode," Trans. Electroch. Soc., **74,** 399, (1938).

[37]Ferguson, A. L., "Polarization and Overvoltage With Special Attention Given to Transfer Resistance," Trans. Electroch. Soc., **76,** 113, (1939).

[38]Mantell, Charles Letnam, Industrial Electrochemistry, 2nd ed., McGraw-Hill, New York-London, 1940.

[39]Kortüm, G., J. O'M. Bockris, Textbook of Electrochemistry, vol. 2, Elsevier Publ. Co., Amsterdam, 1951.

[40]Vagramian, A. T., H. T. Kudriavtsev, M. A. Shluger, editors, Teoria i Praktika Elektroliticheskogo Khromirovania, Moscow, 1957.

[41]Martusevich, G. P., Oscillographic Studies of Anode Passivity, M.S. thesis; Dept. of Chem. Engineering, Newark College of Engineering, Newark, 1958.

[42]Dole, Malcolm, Principles of Experimental and Theoretical Electrochemistry, McGraw-Hill, New York, 1935.

[43]Lingane, James Joseph, Electroanalytical Chemistry, 2nd ed., Interscience Publishers, New York, 1958.

[44]Potter, Edmund C., Electrochemistry, Macmillan, New York, 1956.

[45]Lewis, B. F., "The Relationship of Cleaning Techniques and Adhesion of Electroplate," Proc., Am. Electropl. Soc., **28,** 64 (1940).

[46]Harned, H. B., B. B. Owen, The Physical Chemistry of Electrolytic Solution, Reinhold Publ. Co., New York, 1958.

[47]Kohan, Leonard R., Howard T. Francis, "Zinc Plating of Carbonitrided Steel," Plating, **47,** 1155, 10 (1960).

George Chaplenko was born in 1924 in Ukraina and arrived to United States in 1949 as a refugee, under the I.R.O. refugee resettlement program. He studied electrical engineering at the Polytechnical Institut of Lwiw, Ukraina, and Natural Sciences and Modern Languages at the Ukrainian Free University of Augsburg, Germany. He received his BS in chemistry from Rutgers University in 1955 and his MS with a major in chemical engineering from the Newark College of Engineering in 1961. Mr. Chaplenko is a member of the American Electroplaters' Society and of the American Chemical Society. At the present Mr. Chaplenko is employed as an Assistant Department Manager of the Chemical and Metallurgical Laboratory by The Singer Manufacturing Co. at Elizabeth, N. J. and in his spare time abstracts Ukrainian and Russian technical papers for the "Chemical Abstracts."

THE ELECTRICALLY ASSISTED CHEMICAL MILLING OF ALUMINUM

by JOHN E. SPESSARD*

THE CHEMICAL MILLING of aluminum and aluminum alloys is an important process in the aircraft industry as chemical milling possesses many advantages in convenience and cost over mechanical milling.

The etchant normally used is sodium hydroxide solution but it has been found that sodium hydroxide alone will not etch aluminum alloys satisfactorily, as the finished surface is too rough. This is believed due to a plating out of copper and zinc on the aluminum surface due to chemical action. These metals can be removed from the solution by precipitation as sulfides.[1] Under these conditions an acceptable surface is obtained.

An investigation was made to determine if copper and zinc could be removed from solution by electrodeposition at the same time that work was being milled. This would have made it possible to use sodium hydroxide as an etchant without recourse to sulfide additives or having any tank down-time. The part being chemically milled was made the positive pole or anode. A copper sheet made a satisfactory cathode. In laboratory tests, a surface was obtained superior to that usually obtained in practice and in addition, there was less dishing of etched surface which made possible a better control of the thickness of the part. This also would make deeper cuts possible.

It was found that the significant factor was the positive dc potential on the surface of the part and that removal of copper and zinc from the solution was not necessary. Thus if the tank were made of metal, it could serve as a cathode. On production work, assuming 100 per cent current efficiency, about 2 per cent of the aluminum would have been removed electrolytically and 98 per cent chemically. Currents of 60–90 amperes at potentials of 4–6 volts were used in production work. A surplus welding machine was used as a dc source.

In laboratory tests a 6 by 6 by 1 in. panel of 7075 alloy was milled on a 4 by 4 in. area until the final thickness ranged between 0.010–0.030 inches. For an etch of almost one inch, this was excellent. The surface was still acceptable by production standards. As these and other laboratory tests had proven satisfactory, the next step was to use a larger tank where actual production parts could be run by shop personnel and the results compared with regular production work. A tank of 2000 gallon capacity was charged with caustic solution and production parts made of aluminum alloys 2024, 2219, 5052, 6061, 7075 and 7178 were run. The finished parts were submitted to inspectors and subjected to regular production specifications.

The etched surfaces were equal or superior to regular production work and control of the final thickness of the part was very superior. In the cases where parts had "lands" or raised grid patterns, the lands were well-formed, uniform, and reproducible. With 2219 and 7178 alloy parts, the "lands" were too wide. With 2024, 5052 and 6061 alloy parts, the "land" widths met standard specifications. Thus in most cases, the same templates used in standard baths could be used for this purpose. For 2219 and 7178 alloy parts, new templates or rework of existing templates would probably be needed resulting in some expense.

* Contribution from The Process Control Laboratory, General Dynamics-Fort Worth, Texas. Present address—Department of Chemistry, Texas Christian University, Fort Worth, Texas.

TABLE I

COMPARATIVE MERITS OF ELECTRICALLY ASSISTED AND STANDARD CHEMICAL MILLING FOR THE PRODUCTION OF LANDING GEAR ACCESS DOORS

	Standard Method 1 Sept. 1959-30 Apr. 1960	Electrically Assisted 14 July 1960-30 Jan. 1961
	Per cent	Per cent
Production immediately usable with no rework or repair	Less than 5 (est.)	88.5
Disposition of rejected parts		
Scrapped	38.8	0.0
Repaired	57.0	59.6
Used for destructive testing	4.2	40.4

The parts could be wired or clamped in a basket or metal framework that made it possible to etch several parts at once. The + electric lead could be attached to the basket rather than the part, as sufficient electrical contact was provided between the clamp, the basket, the hot caustic solution, and the part to give satisfactory results. If the tank were metal, for best results the basket or part-holding framework should not be set on the bottom of the tank nor should it make contact with the sides of the tank. The basket could be suspended in the tank by non-conducting poles laid across the top of the tank. A 10–12 inch clearance from the basket to the tank was ample (anode to cathode). Even where a single large part or a number of small parts was being etched, only one electrical connection was made to the basket. The quality of the work most distant from the electrical contact was not noticeably different from work closer to the source of current.

The solution was maintained by a formula of C = A + 11, where C is equal to ounces per gallon of caustic and A is equal to ounces per gallon of aluminum with a one ounce per gallon range of caustic on either side. The usable range of aluminum concentration was between one and at least nine ounces per gallon of aluminum resulting in a tank capacity of eight ounces per gallon of etching capacity. This compares favorably with conventional baths.

This process was used to make the landing gear access doors for the B-58. Each part has five or six steps with the final step having a total etch of 0.308 inches and a final thickness of 0.014 ± 0.010 inches. The surface area of the last step is about eleven square feet.

Inspection records for these doors were compared for a seven month period prior to the installation of this process and for the first nine months this process was in full production use. The results are tabulated in Table I.

Total production figures are not released. The estimate of per cent of production immediately usable was provided by production supervision.

Also where rework and repairs were necessary, when the *electrically assisted chemical milling process* was in use, the average time required per part was appreciably reduced. Specifications were also tightened as an adequate supply of parts was now assured. Thus by the use of this system, it was possible to make the parts, meet production requirements and engineering specifications, and markedly reduce the cost of the parts. The system has met a very exacting test and completely proven its merits.

REFERENCES

[1]Newman, et al—U. S. Patent 2,795,491

[2]Spessard, U. S. Patent Application Serial No. 106,274 (1961)

Dr. John E. Spessard received a BS degree in chemistry from the University of Cincinnati in 1951, an MS degree in inorganic chemistry from the University of Louisville in 1952, and a PhD degree in physical chemistry from Oklahoma State University in 1959. From 1959 to 1961 he was at General Dynamics-Fort Worth as a research chemist in The Process Control Department. In 1961, he accepted a position as Assistant Professor of Chemistry at Texas Christian University. His fields of research interest are inorganic complexes and electrochemistry.

SEMI-ANNUAL MEETING
ASTM, COMMITTEE B-8
WASHINGTON, D. C., SEPTEMBER 13-15, 1961

by Edward B. Saubestre
Enthone, Inc., New Haven, Connecticut

Sub-Committee I (Specifications)
F. Ogburn, Chairman

Section B (Definitions) reported that its definitions of plating terms has been published as B-374-61T. Many additional definitions are being considered by Chairman Safranek. R. B. Saltonstall reported that Section G (Multi-Layer Nickel) has had its Standard on multi-layer nickel + chromium on steel published as B-375-61T. He also announced availability of Standards on the CASS test, B-368-61T, and the Corrodkote test, B-380-61T. It was noted that Section H (Thickness Measurements) will revise A-218 for the next meeting. R. A. Ehrhardt then detailed the activities of Section I (Precious Metal Plating). Thin gold deposits are to be studied first. A round-robin will be conducted in various laboratories, to check on the following porosity tests: cupric chloride, polysulfide, and sulfur vapor humidity. Adhesion tests now in various Standards will be reviewed for applicability to gold. Thickness will be checked microscopically for coatings over 50 millionths, but back-up plating will be made mandatory. D. M. Bigge discussed the activities of his Task Group, on better ways to designate coating thicknesses in ASTM Standards. However, no final action was taken.

Sub-Committee II (Performance)
W. H. Safranek, Chairman

The meeting opened with a very interesting color slide show of corrosion of Program IV panels (Cu+Ni+Cr on steel), with commentary by B. B. Knapp. Panels exposed two years at Kure Beach were compared side by side with panels exposed to the CASS test for sixteen hours, and the Corrodkote test for twenty hours. Section A, which is responsible for this program under V. Cassidy as chairman, did not draw conclusions at this meeting. After seeing the slides, the writer got the following impressions:

(1) In very few cases was good protection obtained with less than 1.5 mils of Ni, or of Cu + Ni; (2) effect of a copper under coating remains ambiguous; apparently, when properly applied good results are obtained, but any difficulties in the copper plating step can result in catastrophic corrosion later; (3) variations between two platers in the Program were not too great when only Ni + Cr was present, but when Cu was also present, differences were startling; (4) the CASS and Corrodkote tests give very comparable results, only in a relatively few cases were any significant differences noted; (5) not only do the CASS and Corrodkote tests correlate well with one another, but both correlate well with outdoor exposure after two years at Kure Beach; (6) buffing of Watts nickel is beneficial, this is also true to a lesser degree for bright nickel; (7) the influence of chromium thickness was most pronounced, with corrosion protection improving markedly in going from 10 to 30 to 60 millionths of Cr; (8) however, increasing thickness of Cr increases cracking observed and at 60 millionths, there is notable dulling of the surface.

A somewhat related Program V has been underway for six months at Kure Beach and Newark, and some corrosion has begun on some of the specimens. Program VI (Cu + Ni + Cr on Al) and VII (Cu + Ni + Cr on Zn) are soon to get underway. Plans are also being made for mobile testing of some program panels on trucks in Detroit.

R. E. Harr reported little further change in Section C panels (chromated Cd). The Section E report (Performance of Sn deposits) was given by F. A. Lowenheim. An earlier one-year storage test of various tin, tin-lead, and tin-zinc coatings failed, in that solderability of most specimens did not change during the storage period. In fact, in some cases, solderability improved with age! The solderability test has been revised, and a new program will shortly get underway. Sn coatings (0.05–0.3 mils thick) will be deposited from fluoborate, stannate (both Na and K), and halogen baths. Solderability will be evaluated after 3, 6, and 12 months of controlled humidity storage.

J. D. Thomas reported for his Task Group, which is now reviewing all U. S. systems for rating corrosion of test panels. Q. Elliott was appointed chairman of a new Task Group, which will determine the advisability of drawing up ASTM Standards for peen plating.

Sub-Committee III (Conformance)
A. Squitero, Chairman

Section B (A. Mendizza) on Porosity is testing steel panels plated with 0.2 mils Cu + 0.5 mils Ni + 5–6 millionths Cr. The tests being compared are 20 per cent salt spray, acetic acid salt spray, CASS, Corrodkote, and SO_2. R. E. Shaw reported that Section E (Adhesion) is investigating many tests: heat and air cool or water quench, filing, hammering, chisel, tape, grinding, bending, burnishing, etc. L. Borchet reported that Section F (Stress) is starting up again. Section G (Ductility) under G. Van Tilburg is looking into various tests in the literature and hopes to initiate test work soon.

Sub-Committee IV (Plating Practice)
E. B. Saubestre, Chairman

A letter ballot on B-177 (Chromium on steel) approved a revision concerned with effect of Cr plating on fatigue of high strength steels. However, another revision dealing with effect of fluoride additives was strongly disputed, resulting in setting up of a new Section under C. L. Fuelling to look into the matter. Another letter ballot, on B-322 (Cleaning) resulted in setting up a new Section to investigate need for revisions. H. Chessin will head the new group. Section E (Electroforming), under A. Squitero, has completed plans for a Symposium on Electroforming to be held February 6–7 in Dallas. Chairman and organizer of the Symposium is W. L. Pinner. There will be twelve speakers, movies, and a round table discussion. W. B. Harding reported that Section P (Difficult to Plate Metals) is trying to find out the extent of industrial interest in this area through a questionnaire. Section M (Plating on Nonmetallics) is just getting underway, under C. F. Emery. Section (N), under B. Knapp will look into methods of plating on nickel alloys.

Sub-Committee V (Conversion Coatings)
R. E. Harr, Chairman

A. Mendizza reported that Section A (Chromate on Zn) is checking the hexavalent Cr test as a replacement for the salt spray test. S. Spring of Section E (Phosphating) is studying phosphate coatings on unpainted parts, whether plated or not. Of various tests studied, such as the Springfield chloride immersion test, humidity cabinet test, boiling water test, and water spot tests including peroxide type, the latter appears most suitable for further testing. C. W. Ostrander reported that Section H (Chromates on Al) has investigated several tests, with more work underway.

Sub-Committee VI (Anodizing of Al, Mg)
W. Cochran, Chairman

It was decided to retain B-136 (Test for Sealing of Anodic Coatings) for the present, despite very considerable evidence that dye tests of this type are quite unreliable. J. Kerr reported that his Task Group plans to improve B-136, but to refer to it in the future as a "test for stain or dye resistance." This activity points up sharply the critical need in industry for a reliable way of checking the degree of sealing of anodic coatings. Another group is also planning minor changes in B-110. A Task Group headed by R. Paulson submitted a proposed new Standard on measurement of anodic coating thickness, using eddy current methods. This Standard will also list suitable instruments currently available for sale in the U. S. The proposal was accepted and forwarded to B-8.

BEST BRANCH PUBLIC RELATIONS DEED TO BE RECOGNIZED

At its meeting held in Buffalo, September 16, the Executive Board empowered the AES Public Relations Committee to appoint its own Subcommittee to evaluate the public relations activities of respective chartered Branches of the Society during the fiscal year as reported in PLATING MAGAZINE, and to choose and recognize that particular Branch public relations deed adjudged most outstanding by said Subcommittee.

To the winning Branch, the Public Relations Committee was authorized to present a suitable letter of commendation, midst appropriate ceremony, at the Society's Annual Convention.

LIFT! HELP YOUR BRANCH ATTAIN ITS MEMBERSHIP EXPANSION GOAL

LOS ANGELES TO AWARD MEMBERSHIP EXPANSION PRIZES

The Los Angeles Branch is an example of the "maximum effort" now being given by AES chartered Branches during the current Branch Membership Expansion Campaign so as 1) to expand their rosters of Active Members in good standing by the addition of qualified "new members" and 2) to reclaim qualified "former members" who for some valid reason dropped out of AES membership.

In the Los Angeles Branch Campaign headed by Branch First Vice President Harvey K. Hunt, every member is a "campaigner." To him who stimulates the largest number of new members during the current fiscal year will go the Branch's First Prize, namely a $50 bond. The second place winner will be awarded a $25 bond. A full year's paid Branch dues will be the award of the third place winner.

STORY WITH A HAPPY AES CLIMAX

This is a story with a happy climax. It concerns a "lost" AES Past National President who has joyfully been "found."

For some years, the whereabouts of Past National President Walter J. Allen, the Society's earliest living head, could not apparently be traced. He had evidently retired—had moved—and, to AES at least, had evidently become lost in the vicissitudes of fast-passing years. But not long ago, Past National President Frederick Fulforth, now himself retired and now happily living in Florida where he is now Branch Secretary of AES's Miami Branch, happily located Mr. Allen—and a glad reunion occurred in Miami.

Currently a hale and hearty 88 years of age, Mr. Allen resides with his charming wife in Miami. He still cherishes the memories of his conspicuous AES service dating from his entrance into Detroit Branch membership in February 1913. With the late J. C. Miller, he helped organize the Grand Rapids Branch. He was elected to National Office in 1920, and headed the Society as National President in 1922–23—nearly four long decades ago.

Above are Past National President and Mrs. Walter J. Allen as they appeared on their recent 63rd wedding anniversary. To them, AES and PLATING MAGAZINE extend best wishes for many happy returns.

TENTATIVE MILWAUKEE CONVENTION EDUCATIONAL PROGRAM BLUE-PRINTED BY EDITORIAL BOARD

Focused upon creating one of the most versatile Convention Educational Session Programs in the Society's long Convention history for the upcoming 49th Annual Convention, Milwaukee, June 24–28, 1962, the Editorial Board blueprinted a ten-session tentative program at its meeting held at National Headquarters, Newark, September 21–22, 1961, with Board Chairman John P. Nichols presiding.

As preliminarily targeted subject to subsequent pruning, the tentative program embodies 1) The Fourth Annual William Blum Lecture 2) a three-paper "Research Session" 3) a three-paper "Color Session" 4) a three-paper "Specifications Session" and 5) general sessions composed of a versatile array of technical papers on respective phases of electroplating, metal finishing and allied arts. Also tentatively under consideration is the possibility of a round table discussion, to occur late Monday afternoon June 25, on the subject of "Cost Saving Ideas in the Plating Room."

So as to enable as many other qualified members and non-members of the Society to volunteer important original technical papers for Convention Program consideration, the Editorial Board extended to December 1, 1961, the period during which such papers may be offered—provided, however, that a first rough draft of the offered paper itself, and a final abstract thereof, be in the hands of Host Branch Educational Sessions Chairman Joseph M. Andrus by or before that date. So as to insure the most effective possible review of submitted papers, moreover, Editorial Board reviewers were assigned at this meeting for that purpose instead of at the next meeting of the Board as heretofore.

The all-day business session of the Editorial Board on Friday, September 22 was preceded by an evening-long session of "long-range planning" on the prior evening. Board Members present aside from Board Chairman Nichols and Board Secretary Rodney Leeds were Joseph M. Andrus, Dr. Henry Brown, Dr. Henry L. Kellner, Dr. Frederick A. Lowenheim, George J. Marotta, Dr. Joseph V. Petrocelli, Harold W. Scott and Dr. Edward B. Saubestre.

FUTURE MEETINGS

Education is the business of AES. For National, Regional and Branch educational and other AES meetings ahead, see PLATING's section titled FUTURE MEETINGS herein.

AES NEWS

BOSTON CONVENTION TECHNICAL PAPER REPRINTS PURCHASABLE

Fast nearing completion, the 1961 Edition of TECHNICAL PROCEEDINGS will expectedly be ready for mailing to all members in good standing of AES (as at November 1, 1961), as an entitlement of AES membership, by mid-November as usual. Thereafter, excess copies of the book will be offered for purchase at a per-copy price of $18 domestic, $22 foreign, including postage—full payment with order required.

The 1961 Edition embodies the full text and illustrations of every technical paper presented by experts at the Society's 48th Annual Convention, Boston, Massachusetts, June 18–22, 1961, together with the transcript of the discussion that attended the delivery of each such paper.

For those companies or individuals desiring to purchase a quantity of reprints of any of the copyrighted papers appearing in that AES book (other than the four Aluminum Finishing papers delivered before the "Finishing of Light Metals" Symposium of that AES National Convention), there is a price list available upon request, specifying cost and how to order. Address your request for information to Thomas W. Lowe, Production Manager, TECHNICAL PROCEEDINGS, American Electroplaters' Society, Inc., American Building, 443–445 Broad Street, Newark 2, N.J.

AES 61st BRANCH TO BE INSTALLED NOVEMBER 16

The AES's newly chartered Central Iowa Branch will be formally installed by National President Chester G. Borlet as the Society's 61st Branch at an installation meeting painstakingly being arranged by the new Branch, to be held at the Roosevelt Hotel, Cedar Rapids, Iowa on Thursday evening, November 16.

President Borlet will not only install the Branch and present it with its laminated Permanent Charter but will also install the neophyte Branch's first complement of elected AES Branch Officers, and will indoctrinate its first group of elected Branch Delegates and Alternate Delegates.

He will be aided by Past President Clyde Kelly who was so instrumental in the creation of said Branch that, after its required probationary period under Temporary Charter, was granted its Permanent Charter by the Executive Board effective August 1, 1961.

EXECUTIVE BOARD LEGISLATED WIDELY AT ITS SEPTEMBER BUFFALO MEETING

The completion of its plans and media for conducting the referendum ordered by the Supreme Society, AES's governing council, affecting the continuation of TECHNICAL PROCEEDINGS as an entitlement of AES membership, was a prime action taken by the Executive Board at its meeting held September 16 at the Statler-Hilton Hotel, Buffalo, New York, with National President Chester G. Borlet presiding.

As a result, the referendum is in progress with Letter Ballots now in the hands of all accredited Delegates composing said governing council, each deadlined for execution and return to National Headquarters by or before November 6. As its Committee of Tellers, the Board appointed Robert A. Ehrhardt (Chairman) and William L. Grigat and Gustav Bittrich of the Newark Branch.

The Board also received a progress report from Past President Cleveland F. Nixon, Chairman of the "AES Constitution and Bylaw Revision Committee" and Leslie L. Diveley, his second in command, as to developments to date in that significant Committee's concentrated work to complete a preliminary draft of a reconstructed AES Constitution and Bylaws for tentative consideration by the Supreme Society at its Ninth Interim Meeting to be held in Indianapolis January 13.

Among many other policy and procedural matters considered and disposed, the Board approved the certified Audit Statement of the Society and its PLATING MAGAZINE and Research Program, for the fiscal year July 1, 1960–June 30, 1961, that had been submitted by Clyde A. Zukswert and Company, independent certified public accounting company, following exacting annual audit of AES by that assigned company.

The Board also ratified its Letter Ballot action granting a Permanent Charter to the Central Iowa Branch, effective August 1, 1961, and a Temporary Charter to the Santa Clara Branch, effective July 1, 1961. It endorsed the plans and regionalized launching of the Society's 1961–1962 Membership Expansion Program. It approved, with commendation, the results of the research job done by Immediate Past President Wesley in completing the comprehensive list of Honorary Members elected at any time in AES's history. It favorably considered the proposal of the Public Relations Committee that an AES Bylaw amendment be initiated mandatorily requiring each chartered Branch to elect a Branch Public Relations Chairman annually.

In addition, the Board approved the tentative program of events of the coming Ninth Interim Meeting. It accepted the recommendation of the AES Honorary Membership Award Selection Committee, moreover, for a Bylaw amendment increasing from four to five the personnel of said Committee, provided that a minimum of two members thereof shall be AES Past National Presidents.

Present at the meeting besides President Borlet were First Vice President Manuel Ben; Second Vice President Frank O. Beuckman; Third Vice President Edward E. Oberland; Immediate Past President W. Andrew Wesley and National Executive Secretary John P. Nichols. All six National Officers, moreover, attended the special meeting of the Buffalo Branch held the prior evening.

DETROIT BRANCH TO CELEBRATE GOLDEN ANNIVERSARY AT ANNUAL MEETING AND BANQUET

by WILLIAM P. DEVAN

Currently, the Detroit Branch is celebrating its Golden Anniversary year. It will be highlighted by the annual educational session and December party.

The educational session will be held Friday evening, December 1st, at the Hotel Statler. The speaker will be Frank L. LaQue, vice president, manager of Development and Research Division, International Nickel Company. The subject will be "What We Know and Do Not Know about Corrosion."

The following evening, Saturday, December 2, the annual banquet will also be held at the Hotel Statler. To start the affair there will be a cocktail hour sponsored by a group of suppliers. This is to be followed by a dinner, an outstanding floor show and dancing for the balance of the evening.

Norman A. Smith of Electro Finishing Industries Inc. in Detroit is chairman for the December party.

REMINDERS TO AES CHARTERED BRANCHES

A complete roster of your Branch Members in good standing as at June 30, 1961 as officially recorded at National Headquarters was sent to you on July 1, 1961 together with a Per Capita Tax invoice for the fiscal year July 1, 1961-June 30, 1962, and other vital data. If you have not yet checked and returned that list to National Headquarters, it is of mutual essence that you do so promptly.

♦

The list of your Branch's duly elected Branch Delegates and Alternate Delegates for 1961-1962 is due in the hands of the National Executive Secretary by or before *November 6, 1961* for accreditation. (Reference: AES Bylaws, Part II, Article VII, Section 1). Your list should be filed on the official form that has been provided to you by National Headquarters, and must be signed by both the Branch President and Branch Secretary.

♦

Your Branch, via its accredited Delegates, has been invited to nominate any qualified member of the Society whom it chooses for consideration for AES Honorary Membership. Your choice must be supported by six copies of a statement of qualifications. These are all due in the hands of the National Executive Secretary by not later than *November 15, 1961* by the recorded rules of the Supreme Society. No nominations will be accepted after that date.

♦

Your Branch, through its President of record, will be invited to nominate any member of the Society whom it chooses for consideration for the Charles Henry Proctor Memorial Leadership Award for 1961-1962. More information soon.

♦

If your Branch is among those very few Branches that have delayed to now in appointing a Branch Research Finance Chairman to spearhead your Branch's effort to stimulate Sustaining Membership applications by industrial companies in your area, with the help of the Regional Research Finance Chairman for your territory, please do so promptly and submit his name to the National Executive Secretary's office at earliest possible time for processing.

(Top) Chester G. Borlet, AES National President, left background, installs new officers of Dallas-Fort Worth Branch. L to r, R. F. Howard, D. L. Allie, R. F. Walton, T. E. Betz, M. A. Davison, D. Cox and E. W. Turns. (Bottom) Dais and a few of the attendees at the Annual Meeting and Banquet.

DALLAS-FORT WORTH ASSEMBLY ADDRESSED BY AES NATIONAL PRESIDENT

National President Chester G. Borlet was the honored guest at the first Autumn Meeting and Annual Banquet of the AES Dallas-Ft. Worth Branch held at the Statler-Hilton Hotel, Dallas, September 14. Some hundred Branch Members and guests first enjoyed an elaborate Fellowship Hour sponsored by local metal finishing concerns and suppliers in the Embassy East Ballroom, then enjoyed the excellent Banquet.

Retiring Branch President W. L. Aves, Jr., introduced National President Borlet, who spoke on "Highlights of AES Activities." Mr. Borlet also installed the following Branch officers: R. F. Howard, President; D. L. Allie, First Vice President; R. F. Walton, Second Vice President; T. E. Betz, Secretary; M. A. Davison, Treasurer; D. Cox, Educational Chairman; and E. W. Turns, Recording Secretary.

President Howard thanked Branch members for their fine efforts in obtaining the 1967 National Convention for Dallas and the work done on AES Research Project No. 20. He called upon M. E. Browning, Co-Chairman of Project No. 20 ("Vapor Deposition") to present the final check to Dr. R. L. Hoyle, Research Fellow of Project No. 20, for completion of Phase 1 of said research.

National President Borlet, left, congratulates and presents gavel to Branch President Howard.

D. L. Allie, Committee Chairman for the 1967 National Convention, discussed some timely aspects involved in this national venture. President Howard thanked the ladies and guests for their attendance and turned the meeting over to T. E. Betz, Banquet Chairman, for the entertainment portion which included an impressive Arthur Murray dance exhibition. The evening's activities concluded with dancing to the music of Ernie Shield's popular orchestra.

Crowded Technical Session of the Third Metropolitan Regional, Hosted by New York Branch at the Statler-Hilton Hotel, New York, on September 22. Story in Newark Branch and New York Branch news on pages 1263 and 1264 this issue.

EVERY 1961-1962 AES RESEARCH PROJECT REVIEWED AT RESEARCH COMMITTEE'S SEPTEMBER MEETING

With Vice Chairman for Research Burton B. Knapp reporting and quarterbacking the discussion, the pulse of every extant 1961–1962 AES Research Project was taken by the AES Research Committee at its meeting held at National Headquarters, September 29, 1961, with Chairman Harold J. Wiesner presiding.

Five of the 1961–1962 projects are currently active. Project No. 19 ("Galvanic Effects Associated with Coating Failure"), a new project, is expected to gain momentum as promptly as a Research Fellow has been appointed. The first phase of Project No. 20 ("Plating by Thermal Decomposition"), another new project, has been completed. The Research Committee will give consideration at its next meeting as to undertaking the second phase—after evaluating the reported results of the first phase.

At its meeting, the Research Committee also considered the possibility of having at least two Project papers ready for presentation at the AES' Milwaukee Convention in June 1962. It also authorized the publishing of Serial Report No. 48 (Project 14) and Serial Report No. 49 (Project 18). These will follow on the heels of Serial Reports No. 46 and 47 recently published and disseminated.

Among much other business transacted, the Research Committee approved the certified audit statement of Clyde A. Zukswert and Co., independent certified public accountant, covering the results of its examination of the books of record of the AES Research Program for the fiscal year July 1, 1960–June 30, 1961.

Much attention was given at the meeting to the report on proposed new AES Research Projects brought by William P. Innes, Chairman of its Subcommittee on New Projects. It endorsed the regionalized Sustaining Membership expansion campaign now launched under the supervision of Vice Chairman for Finance Edward J. Kubis. The Committee also engaged in a period devoted to "long range planning."

Committee members present at the meeting, in addition to the aforementioned, were Harold A. Kahler, R. Scott Modjeska, John P. Nichols, Clarence H. Sample and Irvin M. Weiss.

NOTICE OF MEETING

SUPREME SOCIETY
AMERICAN ELECTROPLATERS' SOCIETY

To the accredited Delegates and Alternate Delegates composing the Supreme Society, governing council of AES, this represents Notice of Interim Meeting to be held at the Marott Hotel, Indianapolis, Saturday, January 13, 1962, starting at 10 a. m. sharp, pursuant to AES Bylaws Part 1, Article VI, Section 9.

The Agenda of said meeting will both be mailed to Delegates and Alternate Delegates and will be published in the December issue of PLATING MAGAZINE for study in advance of said NINTH INTERIM MEETING.

Any other representative of a chartered AES Branch, or any member in good standing of the Society will, of course, be welcome to attend as an auditor.

AMERICAN ELECTROPLATERS' SOCIETY
Chester G. Borlet
National President

Quentin O. Shockley
Chairman, Arrangements Committee, Indianapolis Branch

EXTENDED OPPORTUNITY TO AUTHORS INTERESTED IN MILWAUKEE CONVENTION PARTICIPATION

So as to implement the emphasis that is being placed by the AES Editorial Board in creating an educational program for the AES's Annual Convention to occur in Milwaukee, Wisconsin, June 24–28, 1962 that will be so significant and appealing that few persons seriously interested in educational enrichment in electroplating, metal finishing, organic coating and other such subjects can afford to miss it, the Board has extended to December 1, 1961, the deadline date for receiving authors' expression of definite desire to participate in that program.

Consequently, AES member or non-member authors of original, unpublished technical and scientific papers on electroplating, metal finishing, organic coating and allied arts wishing to be considered as prospective participants in that Milwaukee educational program are cordially invited to communicate promptly either with Host Branch Educational Chairman Joseph Andrus direct (Address: 62-01 Howard Street, Chicago 48, Illinois) or through the Editor of PLATING MAGAZINE, 443–445 Broad Street, Newark 2, New Jersey.

Particularly desired for consideration are proposed original technical papers on the subjects of mechanical finishing, organic coating, pickling, and etching of aluminum for finishing purposes.

You are therefore urged to record your availability with Mr. Andrus forthwith. In doing so, it is mandatory that you specifically state your subject and that you send both a FIRST ROUGH DRAFT of your manuscript and an abstract thereof.

TENTATIVE PROGRAM OF EVENTS
NINTH INTERIM MEETING

SUPREME SOCIETY
AMERICAN ELECTROPLATERS' SOCIETY
MAROTT HOTEL
INDIANAPOLIS, INDIANA
JANUARY 11–14, 1962

THURSDAY, JANUARY 11
9:00 a.m.—Editorial Board (All Day)
8:00 p.m.—AES Executive Board Meeting

FRIDAY, JANUARY 12
9:00 a.m.—AES Executive Board (Noon Recess)
9:00 a.m.—AES Constitution & Bylaws Revision Committee (All Day)
2:00 p.m.—AES Educational Committee
2:00 p.m.—AES Membership Committee
6:00 p.m.—Dutch Treat Dinner
8:00 p.m.—Indianapolis Special Branch Meeting

SATURDAY, JANUARY 13
10:00 a.m.—Ninth Interim Meeting, SUPREME SOCIETY
1:00 p.m.—Dutch Treat Luncheon
2:00 p.m.—Ninth Interim Meeting, SUPREME SOCIETY
8:00 p.m.—Joint Meeting, Executive Board and AES Constitution and Bylaws Revision Committee

SUNDAY, JANUARY 14
9:00 a.m.—Executive Board Meeting (To Adjournment)

FORTY-NINTH ANNUAL CONVENTION
AMERICAN ELECTROPLATERS' SOCIETY, INC.

SPONSOR: American Electroplaters' Society, Inc. (AES), American Building, 443-445 Broad Street, Newark 2, New Jersey, and its 61 chartered American, Canadian and Australian Branches.

HOST: The Midwest Regional Council of AES, including its Chicago, Milwaukee, Mississippi Valley, Rockford, St. Joseph Valley and St. Louis Branches.

SITE AND HOTEL: Schroeder Hotel, Milwaukee, Wisconsin.

DATES: June 24-28, 1962, in AES's fifty-third year.

ADULT REGISTRATION: For male and female adults—$25 per person including Banquet, Outing, and all other AES official Convention events.

CHILDREN REGISTRATION: For registered children—$15 per child, not including Banquet, but including three days of supervised sightseeing and children's program events, plus the Outing.

HOTEL ACCOMMODATIONS: Order direct via Hotel Reservation Form to come to AES members in January 1962 from the Convention Committee via AES National Headquarters.

CONVENTION GENERAL CHAIRMAN: Herman A. Tessmann (Milwaukee Branch), 3864 South 57th Street, Milwaukee, Wisconsin.

LADIES CHAIRMAN: Mrs. Charles Auchter, 920 East Wye Lane, Milwaukee 17, Wisconsin.

GRAND OPENING SESSION • EDUCATIONAL PROGRAM • AES BOARD AND COMMITTEE MEETINGS • LADIES PROGRAM • CHILDREN'S PROGRAM • PLANT TOURS • DANCES • SIGHTSEEING • OUTINGS • UNIQUE CONCERT • SPONSORED RELAXATIONAL PROGRAMS • COCKTAIL PARTIES • GET-TOGETHER • GOLF TOURNAMENT • BANQUET • ENTERTAINMENT • FLOOR SHOW • ANNUAL BLUM LECTURE

Looking East, Wisconsin Avenue—often referred to as Milwaukee's "magnificent mile". The "Schraeder" is in the background.

KNOWLEDGE AND YOU!

Imparting technical knowledge on electroplating, metal finishing and allied arts is the prime function of any AES National Convention—and that policy and practice will mark the Society's 49th Annual Convention, June 24-28, 1961 at the Schroeder Hotel, Milwaukee, Wisconsin, with the AES's Midwest Regional Council as Host.

Being programmed by the Host Region's Educational Session Committee headed by Joseph M. Andrus (Chicago Branch), under the planning and supervision of the Society's Editorial Board, is one of the most versatile Educational Session programs in AES's long convention history.

Besides the Fourth Annual William Blum Lecture, the tentative program envisions 1) a Research Session, 2) a "Color" Session, 3) a "Specifications" Session, 4) general sessions on other phases of plating, finishing and allied arts and 5) a possible "round table" on "Cost Saving Ideas in the Plating Room." Watch PLATING MAGAZINE's future issues for further information as it develops.

PLAN NOW TO ATTEND
AES'S MILWAUKEE CONVENTION,
JUNE 24-28, 1962

Hotel Schroeder, 1962 AES Convention Headquarters

44 SELECTED BOOKS ON ELECTROPLATING, METAL FINISHING AND RELATED SUBJECTS AVAILABLE FROM AMERICAN ELECTROPLATERS' SOCIETY, INC.

AMERICAN BUILDING, 443-445 BROAD STREET, NEWARK 2, NEW JERSEY

ALL ORDERS MUST BE ACCOMPANIED BY PAYMENT IN FULL

	Non-members	AES Members
*Hydrogen Embrittlement in Metal Finishing Edited by Harold J. Read. 240 pages.	7.50	6.50
*Water Treatment for Industrial and Other Uses, 2nd edition ..... by Eskel Nordell. 528 pages.	12.00	10.50
Electroplating Engineering Handbook .... Edited by A. Kenneth Graham. 650 pages.	$10.00	$6.00
Protective Coatings for Metals. 2nd edition by R. M. Burns and W. W. Bradley. 657 pages.	12.50	11.00
Analysis of Electroplating and Related Solutions—2nd edition, 1958..... by K. E. Langford. 423 pages.	9.00	7.50
Chromium Plating ..... by P. Morisset, J. W. Oswald, C. R. Draper and R. Pinner. 611 pages.	11.00	9.75
Electrochemistry—Principles and Applications ..... by E. C. Potter.	10.00	8.50
Handbook of Practical Electroplating..... by Thomas M. Rodgers.	8.50	7.25
Electroplating for the Metallurgist, Engineer and Chemist ..... by J. B. Mohler and H. J. Sedusky. 257 pages.	5.00	4.75
Surface Treatment and Finishing of Aluminum and its Alloys ..... by S. Wernick and R. Pinner. 607 pages.	13.25	12.25
Vapor-Plating ..... by C. F. Powell, I. E. Campbell and B. W. Gonser—158 pages.	5.50	4.75
Hot Organic Coatings. 225 pages..... by Raymond B. Seymour.	7.50	6.50
Mechanical Polishing ..... by W. Burkart, H. Silman and C. R. Draper. 267 pages.	9.25	8.25
Coated Abrasives—Modern Tool of Industry ..... Coated Abrasives Manufacturers' Institute.	4.75	4.00
ASME Handbook—Metals Engineering Processes ..... Edited by Roger W. Bolz	13.50	11.50
Statistical Analysis in Chemistry and the Chemical Industry ..... by C. A. Bennett and Norman L. Franklin	9.50	8.25
Principles of Industrial Waste Treatment... by C. Fred Gurnham.	9.50	8.25
Radioisotopes for Industry..... by Robert S. Rochlin and Warner W. Schultz. 210 pages.	4.75	4.25
Industrial Wastes—Their Disposal and Treatment..... Edited by Willem Rudolfs. 450 pages.	7.95	7.35
A Practical Manual of Industrial Finishes.. by Barnet Mark Letsky. 263 pages.	8.00	6.95
1960 Supplement to Metal Cleaning Bibliographical Abstracts—STP 90-E. 36 pages	2.00	1.85
Rare Metals Handbook, 2nd edition..... Edited by C. A. Hampel. 715 pages.	20.00	16.50
Metallizing of Plastics..... by Dr. Harold Narcus. 208 pages.	5.50	4.75
Cathodic Protection..... by John H. Morgan. 319 pages.	12.00	10.25
Elementary Science for Electroplating Students and Foremen..... by E. A. Ollard. 99 pages	2.80	2.50
Procedures for Analyzing Metal-Finishing Wastes. 102 pages.....	1.00	1.00
Electroless Nickel Plating STP265.....	2.50	2.35
Control in Electroplating—Symposium.... Institute of Metal Finishing, England. Papers by K. E. Langford, T. E. Such, C. F. Corfe and D. W. Smith. 92 pages.	2.50	2.25
Effect of Surface on the Behaviour of Metals Papers by G. L. J. Bailey, T. P. Hoar, F. T. Barwell and R. W. B. Stephens. 100 pages.	10.00	9.00
Zinc—The Science and Technology of the Metal, Its Alloys and Compounds.... Edited by C. H. Mathewson. Over 700 pages.	19.50	17.50
Paint Finishing in Industry ..... by A. A. B. Harvey. 516 pages.	12.00	9.75
New Instrumental Methods in Electrochemistry ..... by P. Delahay. 455 pages.	13.00	12.25
Semiconductor Abstracts—Compiled by Battelle Memorial Institute, Sponsored by The Electrochemical Society..... Volume IV—1956. 456 pages.	12.00	10.25
Electroanalytical Chemistry..... by J. J. Lingane. 683 pages.	14.50	12.75
Chromium—Two Volumes. Both..... Edited by Marvin J. Udy. 857 pages.	19.50	17.50
Volume 1—447 pages.....	11.00	9.75
Volume 2—410 pages.....	11.00	9.75
Electropolishing, Anodizing & Electrolytic Pickling of Metals..... by N. P. Fedot'ev and S. Ya. Grilikhes. 285 pages.	8.40	7.50
Fundamentals of Electrochemistry and Electrodeposition..... by Dr. Samuel Glasstone.	3.20	2.90
Modern Science Dictionary..... Compiled by A. Hechtlinger. 784 pages.	10.00	9.00
Tin and Its Alloys..... Edited by Ernest S. Hedges. 432 pages, 187 illustrations.	27.50	25.00
Organic Coating Technology. Vol. 2—Pigments and Pigmented Coatings.... by Henry Fleming Payne. 724 pages.	17.50	15.35
Vacuum Processes in Metalworking ..... by J. Wesley Cable. 208 pages.	5.50	4.95
Compilation of ASTM Standards, Soaps and Other Detergents. 280 pages.....	4.25	3.85
Nickel-Chromium Plating..... IMF Symposium. 139 pages.	3.75	3.35
Transactions of the Symposium on Electrode Processes..... Edited by Ernest Yeager. 374 pages.	20.00	17.50

FOR ANNUAL "TECHNICAL PROCEEDINGS", AMERICAN ELECTROPLATERS' SOCIETY, INC. (CONVENTION PAPERS PLUS DISCUSSIONS) 1957, 1958, 1959, 1960 EDITIONS, SEE ADVERTISEMENTS ON FOLLOWING PAGES.

*New Listing

AWAITING YOUR ORDER...

American Electroplaters' Society's readable and understandable illustrated booklet, an AES mighty mite, titled:

INTRODUCTION TO ELECTROPLATING

by

EZRA A. BLOUNT
Editor, PRODUCTS FINISHING MAGAZINE

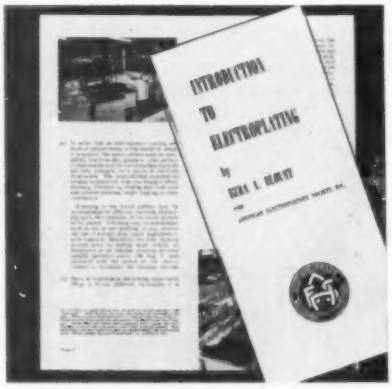
Now available either 1) for single copy purchase by individuals desiring a "McGuffey's Reader" type of authoritative indoctrination in Electroplating and Metal Finishing . . . or 2) for bulk copy purchase by companies or individual enterprises of the industry wishing such an elementary medium for the quick, reliable orientation of their apprentices, beginners or line personnel or for other educational or institutional purpose.

CONTENTS

I. What is Metal Finishing?
II. What is Electroplating?
III. Processing of Parts in the Plating Plant
IV. Plating Equipment
V. Good Workmanship
VI. Safety
VII. Need for Self Improvement

20 pages. Text illustrated by 17 instructive photographs

It was inspired by a stalwart of the Public Relations Committee of American Electroplaters' Society, Inc. (AES)—was initiated and endorsed by AES's Publications Committee—authored by one of the industry's best qualified authorities—approved by the Society's Executive Board—designed and created by AES's National Headquarters' publishing staff.



HOW TO ORDER YOUR COPY

All orders must be accompanied by payment in full, by check or money order (USA currency). USA stamps acceptable only on single copy orders.

1-99 copies....35c each
100-999 copies.....30c each
1000 copies or more.....25c each

Orders accepted from outside of the USA's continental limits at 50c per booklet, including postage to any single destination.

USE THIS CONVENIENT ORDER FORM

AMERICAN ELECTROPLATERS' SOCIETY, Inc.
American Building, 443-445 Broad Street, Newark 2, N. J.

Please rush.....copy (ies) of "INTRODUCTION TO ELECTROPLATING."
I am enclosing payment (or purchase order with payment) and understand that the price includes postage cost of my entire ordered quantity to the following single destination in the USA or Canada.

NAME.....
(Please Print)
ADDRESS.....
CITY AND ZONE.....STATE.....

ACCLAIMED 1960 EDITION "TECHNICAL PROCEEDINGS" AWAITING YOUR ORDER

AMERICAN ELECTROPLATERS' SOCIETY, INC. (AES) having accommodated its farflung membership with free copies of the internationally lauded 1960 Edition of its annual book, TECHNICAL PROCEEDINGS, AES, the book's exclusive publisher, now has a limited quantity of extra copies available for sale to AES non-members, on strictly a "first come-first served" basis so long as that limited supply lasts.

Comparable in quality to the GOLDEN JUBILEE EDITION of TECHNICAL PROCEEDINGS (1959 Edition) that earned worldwide acclamation in technical, scientific and other educational circles, AES's 1960 Edition, another treasure chest of knowledge on electroplating, metal finishing, organic coating and allied arts, contains the full text of each of the 31 papers delivered by experts before the 47th Annual Convention of American Electroplaters' Society, Inc., held in Los Angeles, California, July 24-28, 1960.

Embodying, too, the charts, diagrams, graphs, tables and other illustrations of each of the 31 published papers, the book also includes the transcript of the discussion that attended the delivery of each paper. A full list of the papers published in this voluminous repository of education appears below:

HOW TO ORDER YOUR COPY

Orders for copies of the book are now consequently invited from AES non-members, and will be accepted on strictly a "first come-first served" basis so long as that extra supply lasts. The book is unavailable for purchase elsewhere.

Within the continental limits of the United States, the domestic price of this 1960 Edition of AES's TECHNICAL PROCEEDINGS is $18 per copy including postage.

To those ordering from outside the United States' continental limits, the charge is $22 per copy including postage. All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building • 443-445 Broad Street • Newark, New Jersey, U.S.A.

CONTENTS, 1960 EDITION

Acid Gold Plating *by Robert A. Ehrhardt*, Bell Telephone Laboratories, Inc.

Adhesion of Organic Enamels to Electrodeposited Nickel *by Francis X. Carlin*, The International Nickel Company, Inc., Research Laboratory

AES Research—Its Purpose and Accomplishments *by J. D. Thomas*, 1959–1960 Chairman, AES Research Committee

Applying Statistical Quality Control to Plating Processes *by Robert W. Steinmetz*, Western Electric Company, Inc.

Behavior of Hydrogen in Iron and Steel *by Maynard L. Hill*, Westinghouse Electric Corporation Research Laboratories

Chemical Milling: Controlled Metal Removal with Chemicals *by C. Conner Shepherd*, North American Aviation, Inc.

Chemical Reduction of Nickel-Phosphorus Alloys from Pyrophosphate Solutions *by Morton Schwartz*, Kelite Corporation

Chromium Plating of Rifle Barrels *by Robert J. Girard and Edward F. Koetsch Jr.*, Springfield Armory

Cleaning Techniques in the Electronics Industry *by Dr. D. E. Koontz, Dr. D. O. Feder and Dr. C. O. Thomas*, Bell Telephone Laboratories, Inc.

Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate *by Dr. W. F. Hamilton and Myron Levine*, Lockheed Aircraft Corporation, California Division

Corrosion and Electrode Potential Studies of Nickel-Chromium Coatings *by Arthur H. DuRose*, The Harshaw Chemical Company

Corrosion Protection with Decorative Chromium *by Dr. E. J. Seyb*, Metal & Thermit Corporation

Cyanide Bath for Heavy Gold Plating *by James K. Gore and Robert Seegmiller*, University of California, Los Alamos Scientific Laboratory

Detection and Control of Chemisorbed Hydrogen During Electrolysis *by Samuel C. Lawrence Jr.*, Metal Physics Laboratory, Boeing Airplane Company

Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra High Strength Steel *by Dr. Walter Beck and E. J. Jankowsky*, Naval Air Material Center, Aeronautical Materials Laboratory

Experience in the Operation and Performance of Dual Chromium Systems *by W. E. Lovell, E. H. Shotwell and James Boyd*, Ternstedt Division, General Motors Corporation

Faraday's Laws Applied to Cleaning—"William Blum Lecture" *by Dr. A. Kenneth Graham*, Graham, Savage & Associates, Inc.

Hazards in the Plating Room *by Dr. Walter R. Meyer*, Enthone, Inc., Subsidiary of American Smelting and Refining Company

Magnesium Corrosion *by E. I. Weed*, Convair/Pomona, Division of General Dynamics Corporation

Magnetic Properties of Electrodeposited Cobalt Alloys *by Dr. Victor Zentner*, Hughes Aircraft Company

Measurements Pertaining to Hydrogen Embrittlement *by Dr. Cloyd A. Snavely*, Battelle Memorial Institute

Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing *by Dr. Harold J. Read*, Department of Metallurgy, The Pennsylvania State University

New Data on the Performance of Nickel and Chromium Plated Zinc Die Castings *by W. H. Safranek, H. R. Miller, R. W. Hardy and Dr. C. L. Faust*, Battelle Memorial Institute

New Look at the Hydrogen Embrittlement of Cadmium Coated High Strength Steels *by Norman M. Geyer, G. William Lawless and Bennie Cohen*, Materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base

On the Mechanism of Transport of Hydrogen Across a Solution-Metal Interface *by Dr. Richard J. Barton*, Wright Air Development Division, Wright-Patterson Air Force Base

Plating of Nickel, Cobalt, Iron and Cadmium from Sulfamate Solutions *by Richard C. Barrett*, Barrett Chemical Products Company

Progress Report on Experiences in Improving the Corrosion Resistance of Automobile Parts *by J. D. Thomas, D. W. Hardesty and C. F. Nixon*, General Motors Corporation Research Laboratories

Recent Developments in Gold Electroplating *by Barnet D. Ostrow and Fred I. Nobel*, Lea-Ronal, Inc.

Solid Film Lubricants as Organic Finishes *by Lowell C. Horwedel*, Electrofilm, Inc.

Solution Transfer in Barrel Plating *by Paul Glab, R. Scott Modjeska and Simon P. Gary*, Scientific Control Laboratories, Inc.

Study of Variations in Certain Characteristics of Bright Nickel Deposits with Variations in Bath Temperature *by R. J. Clauss*, The Udylite Research Corporation

CONTENTS, 1958 EDITION

The Role of the Basis Metal in the Production of Stressed Electrodeposits by *Dr. Joseph B. Kushner*, Kushner Electroplating School

Effect of Shot-Peening Prior to Chromium Plating on the Fatigue Strength of High Strength Steel by *Bennie Cohen*, Wright-Patterson Air Force Base

Loose Abrasive Finishing Machines by *Fred T. Hall*, General Motors Corporation

AES Project No. 14—The Influence of Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating
V: Effect of Polishing on the Durability of Nickel Plated Mild Steel by *Dr. Maurice H. Jones and J. Zajdowski*, Ontario Research Foundation

Metal Wastes—Contribution and Effect—Cincinnati Metropolitan Sewage Disposal Service Area by *Fenton H. Dobb*, City of Cincinnati (Sewage Disposal Section)

Ion Exchange and the Pickling of Magnesium Sheet by *Robert E. Anderson*, The Dow Chemical Company

The Use of Bioassays in the Safe Disposal of Electroplating Wastes by *Dr. Charles M. Tarzwell*, Robert A. Taft Sanitary Engineering Center

Industrial Waste Treatment and Water Reclamation—A Case Study by *Wayne L. Gaspar*, The Maytag Company

Principles of Electrochemistry by *Fred G. Brune*, Chrysler Corporation

Factors Which Influence the Structure of Electrodeposits by *Dr. Abraham M. Max*, Radio Corporation of America

Cleaning, Pickling and Preparatory Surface Treatment by *William P. Innes*, MacDermid, Inc.

Typical Plating Solution—Cyanide Zinc by *Edward F. Foley*, Stratford Chemical Co., Inc.

Alloy Plating Systems for Aircraft Engines by *Bruce E. Scott*, Curtiss-Wright Corporation

Heavy Electrodeposited Metallic and Flame-Sprayed Ceramic Coatings in a High Heat Transfer Aerothermal Environment by *Dr. Stanley Zirinsky*, General Electric Company and *Dr. Dodd S. Carr*, Bart Laboratories & Design, Inc.

Hard Anodizing of Aircraft Fuel Metering Components by *Dr. Harold J. Wiesner and Henry A. Meers*, Bendix Aviation Corporation

Pitting in Thick Chromium Deposits by *Donald R. Millage and Wilbur E. Hague*, The Udylite Corporation

Instrumentation by *Harold A. Kahler*, General Motors Corporation

Design and Engineering Problems in Plating Room Layout and Installation by *Hugh V. McGuire*, Enthone, Inc.

Plating Rack Design and Insulation by *Frank J. Klein*, Rack Processing Company

When and How to Select an Organic Coating by *Harris G. Beck*, The Glidden Company
Vinyl Plastisols and Organosols as Product Finishes by *Fremont L. Scott and William C. Hosford*, Metal & Thermit Corporation

Measurement of Chromium Plate Thickness on Molybdenum Alloy Turbine Buckets by X-Ray Fluorescence by *Dr. William M. Spurgeon and Ottis L. Isaacs*, General Electric Co.

Pattern Plating with Electrodeposits by *Samuel S. Frey*, Oakite Products, Inc.

CLEARANCE SALE

PRIOR EDITIONS, "TECHNICAL PROCEEDINGS"

So as both to make the invaluable technical data on electroplating, metal finishing, organic coating and allied arts contained in the 1957 and 1958 Editions of the AES's annual book TECHNICAL PROCEEDINGS, even more generally available and to clear AES's shelves of the limited quantities of those Editions still remaining, the respective per-copy prices of these treasure chests of knowledge have been reduced as an added inducement for purchase.

On a "first-come-first-served" basis so long as supply lasts, these are now offered at the following per-copy prices, including postage.

	Domestic	*Foreign*
1957 Edition.....	$8	$11
1958 Edition.....	$10	$13

All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY

AMERICAN BUILDING • 443-445 BROAD STREET • NEWARK 2, N. J.

CONTENTS, 1957 EDITION

Leveling in Cyanide Copper Solutions—A Further Study by *Barnet D. Ostrow and Fred I. Nobel*

Bright and Semi-Bright Crack-Free Chromium by *Dr. E. J. Seyb, A. Albert Johnson and Angelo C. Tulumello*

Electroplating on Nickel and Nickel Alloys by *W. W. Sellers and C. B. Sanborn*

Corrosion Resistance of Tin and Tin Alloy Electrodeposits by *Frederick A. Lowenheim*

Effects of Plating on High Tensile Strength Steels by *Dr. Walter Beck and Edward J. Jankowsky*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating
IV. The Effects of Different Ferrous Metals on the Performance of a Watts Nickel Deposit by *Dr. M. H. Jones, Chih-Yeu Lu and J. Zajdowski*

Analytical Methods for Trace Quantities of Cyanide Compounds in the Plating Room Effluent by *W. Fred Stevens and Dr. L. E. Lancy*

Accelerators and Their Function in Phosphating Solutions by *Lloyd O. Gilbert*

New Look in Plating Room Power by *C. F. Ivins Jr.*

The Latest Developments in Electroplating with Ultrasonics by *Stanley R. Rich*

Corrosion and Materials of Construction in the Plating Room by *T. J. V. Cudbird*

The Future of Plastics in Electroplating Plant by *Harold Silman*

A Study of Application Techniques in the Use of Liquid Buffing Compounds by *E. T. Candee and S. L. Henn*

The Sisal Story by *Howard J. McAleer*

Barrel Plating by The Chicago Branch, AES, Presented by *Paul Glab*, secretary

Further Studies on Nickel-Iron Electrodeposits by *I. W. Wolf*

Iridium Plating and Its High Temperature Oxidation Resistance by *J. C. Withers and P. E. Ritt*

Surface Catalyzed Reduction of Copper by *Allen E. Cahill*

The Sealing of Sulfuric Acid Anodic Films on Aluminum by *Roy C. Spooner*

An Investigation of Special Electrolytes for Anodizing by *J. M. Andrus*

Effect and Removal of Some Contaminants from Concentrated Phosphoric Acid Aluminum Bright Dip Solutions by *R. F. Ledford and J. F. Jumer*

The Role of Chromate Treatments in the Finishing of Aluminum by *Walter E. Pocock*

Special Price to AES Members...

ELECTROPLATING ENGINEERING HANDBOOK

Edited by **A. KENNETH GRAHAM,** President of Graham, Crowley & Associates, Inc. in collaboration with over 40 widely-known authorities in the electroplating field.

This exhaustive reference is organized into two sections. The first deals with general processing problems in which the various factors are considered in sequence, as would be encountered in ordinary practice. The second section covers engineering fundamentals and emphasizes the economic factors associated with the electroplating industry.

SPECIAL PRICE TO AES MEMBERS

1 copy	**$6.00**
5 copies	**5.50 each**
10 or more	**5.00 each**

Price to Non-Members: $10.00 per copy

NOTE: *All orders must be accompanied by payment in full.*

Use This Convenient Order Form

American Electroplaters' Society, Inc.
443-445 Broad Street, Newark 2, N. J.

Please rush.....copy (copies) of ELECTROPLATING ENGINEERING HANDBOOK

— at AES special member price

— at non-member price of $10.00 per copy

I am enclosing payment (or purchase order with payment) and understand the price includes free delivery anywhere in the U.S.A.

Name.....
(please print)

Address.....

City & Zone.....State.....

CLEARANCE SALE

INTERNATIONALLY LAUDED 1959 "TECHNICAL PROCEEDINGS"

"WE HAVE a record in this part of the U. S. Department of Commerce, of some 5000 National Associations and Societies. Your volume is one of the finest reports of its type which we have had the pleasure of seeing prepared by an Association." Thus did one agency evaluate the Golden Jubilee Edition of the book TECHNICAL PROCEEDINGS (1959) of American Electroplaters' Society, Inc. (AES), its exclusive publisher. AES has a limited number of extra copies available that it is offering for sale at clearance price to AES non-members and others so as to share the book's educational benefits.

Spanning over 400 pages (by far the largest annual TECHNICAL PROCEEDINGS ever published by AES in its 52-year lifetime), the unique book contains the full text of each of the 43 technical papers on electroplating, metal finishing, organic coating and allied arts by experts of nine countries, including the United States, England, Canada, Australia, France, Germany, Holland, India and Italy, delivered before the Fifth International Conference on Electrodeposition and Metal Finishing, educational sessions element of the AES's Golden Jubilee Convention held in Detroit, Michigan, June 15-19, 1959.

HOW TO ORDER YOUR COPY

Orders for copies of the book will be accepted on strictly a "first come-first served" basis so long as AES's supply lasts. The book is unavailable elsewhere.

Within the continental limits of the United States, the domestic clearance price of this Golden Jubilee Edition of AES's TECHNICAL PROCEEDINGS (1959) is now $15 per copy including postage (U. S. currency).

To those ordering from outside the United States' continental limits, the charge is $20 per copy including postage.

All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building • 443-445 Broad Street • Newark, New Jersey, U.S.A.

PRESERVE YOUR COPIES OF PLATING MAGAZINE

To give clean permanence to your copies of PLATING MAGAZINE, this attractive binder is perfect. It has the AES emblem embossed in goldleaf on its spine as well as the name and the year.

$5 in USA. $6 in Canada and Foreign.
(Add $1 for your full name.)

Payment in full must accompany all orders. Please indicate year wanted. Make checks payable and send to

PLATING MAGAZINE
AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building • 443-445 Broad Street • Newark 2, N. J.

CHECK THIS WEALTH OF INFORMATION

The Formation of Simple Ions. The Formation of Complex Ions. Ions in Solutions of Electrolytes. The Conductivity of Solutions. Quantity of Electricity and Faraday's Laws. Faraday's Laws and Current Efficiency. The Ionization of Water and the Significance of pH. The Determination of pH Values by Electrometric Methods. The Theory of pH Indicators. Buffer Solutions and the Determination of pH Values by Indicators. The Significance of Reversible Electrode Potentials. Standard Electrode Potentials and their Applications. Electrode Potentials and the Displacement of Metals. The Deposition Potentials of Metals. Hydrogen Overvoltage and Its Importance in Metal Deposition. Concentration Polarization and the Diffusion Layer. Electrolysis of Complex Cyanide Solutions. Conditions Affecting the Form of Electrodeposited Metals. The Behavior of Anodes: Passivity. The Causes and Prevention of Corrosion.

90 Pages—5¼" x 8¼"

SPECIAL PRICE TO ALL AES MEMBERS

"FUNDAMENTALS OF ELECTROCHEMISTRY AND ELECTRODEPOSITION"

by

DR. SAMUEL GLASSTONE

WRITTEN by one of the nation's foremost scientists—a renowned authority on the subject, with famed faculty for making difficult theoretical subjects sound so simple—this up-to-date reprint edition just published by arrangement with AES includes a new Foreword by Dr. Glasstone and the time-tested contents embodied in the adjacent box.

SPECIAL PRICE TO AES MEMBERS: $2.90 PER COPY.
PRICE TO NON-MEMBERS: $3.20 PER COPY.
ALL ORDERS MUST BE ACCOMPANIED BY PAYMENT IN FULL.

AMERICAN ELECTROPLATERS' SOCIETY, Inc.
443-445 BROAD STREET, NEWARK 2, N. J.

Please rush..... copy (copies) of FUNDAMENTALS OF ELECTROCHEMISTRY AND ELECTRODEPOSITION.

☐ AT AES SPECIAL MEMBER PRICE ($2.90 per copy)
☐ AT NON-MEMBER PRICE OF $3.20 per copy

I am enclosing payment (or purchase order with payment) and understand the price includes free delivery anywhere in USA.

NAME (PLEASE PRINT).....
ADDRESS.....
CITY AND ZONE.....STATE.....

AES RESEARCH PROJECT REPORTS CURRENTLY AVAILABLE

Methods for Testing Thickness of Electrodeposits, II & III—By H. J. Read & F. R. Lorenz — *Serial 27, Project 7, $1.35*

Porosity of Electrodeposited Metals—By N. Thon, D. G. Kelemen, L. Yang, S. Yang, D. Dean — *Serial 28, Project 6, 85 Cents*

The Analysis of Electroplating Solutions for Major Constituents—By E. J. Serfass & M. H. Perry — *Serial 29, Project 2, 90 Cents*

Effect of Basis Metal Condition on Plating, I & II—By A. E. R. Westman & A. F. Mohrnheim — *Serial 30, Project 14, $1.10*

Effect of Surface Finishing on Nonferrous Base Metals on Protective Value of Plated Coatings—By G. J. Kahan, W. W. Macchia, J. M. Fairbank — *Serial 31, Project 4, 45 Cents*

How the Small Electroplater Can Treat Cyanide Plating Waste Solutions with Hypochlorites—By Barnett F. Dodge and Walter Zabban, Yale University, New Haven, Connecticut — *Serial 33, Project 10, 50 Cents*

Effects of Impurities and Purification of Electroplating Solutions, IX, X & XI—By Dr. D. T. Ewing, Dr. A. J. Smith & Dr. W. O. Dow — *Serial 34, Project 5, 50 Cents*

Cleanability and Oil Spreading Rates—By H. B. Linford & P. E. Grubb — *Serial 35, Project 12, 50 Cents*

The Nature, Cause and Effect of the Porosity in Electrodeposits, I & II—By Fielding Ogburn, Asaf Benderly and Margaret Hilkert — *Serial 36, Project 13, $1.00*

Microthrowing Power, A Literature Search—By Esther B. Leffler and Henry Leidheiser Jr. — *Serial 37, Project 17, 75 Cents*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating, IV—By M. H. Jones, Chih-Yeu Lu and J. Zajdowski — *Serial 38, Project 14, $1.25*

Mechanical Finishing of Metal Surfaces—Bibliography—By C. E. Kennedy, J. E. Fritts, R. S. Modjeska, L. E. Weeg & R. V. Twyning — *Serial 39, Project 18, 50 Cents*

The Nature, Cause and Effect of the Porosity in Electrodeposits, III, IV & V—By Fielding Ogburn, D. W. Ernst & W. H. Roberts — *Serial 40, Project 13, 50 Cents*

An Introduction to Fundamental Research on the Mechanism of the Electrodeposition of Metals—By B. E. Conway and J. O'M. Bockris — *Serial 41, Project 16, $1.00*

Cleaning and Preparation of Metals Prior to Electroplating, VIII, IX, X & XI—By H. B. Linford, D. O. Feder & A. Venkateswarlu — *Serial 42, Project 12, $1.75*

Cleaning and Preparation of Metals Prior to Electroplating, XII—By H. B. Linford & J. J. Grunwald — *Serial 43, Project 12, 50 Cents*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating, VI—By M. H. Jones, Chih-Yeu Lu, A. F. Mohrnheim & J. Zajdowski — *Serial 44, Project 14, $1.50*

Cleaning and Preparation of Metal Prior to Electroplating, XIII & XIV—By H. B. Linford, L. Karasyk and J. E. Desmond — *Serial 45, Project 12, $2.25*

The Oxidation of Cyanide-Bearing Plating Wastes by Ozone—By N. E. Sondak and B. F. Dodge — *Serial 46, Project 10, $1.25*

The Nature Cause and Effect of the Porosity in Electrodeposits, VI & VII—By Fielding Ogburn, D. W. Ernst and W. H. Roberts — *Serial 47, Project 13, $1.00*

Include Payment with Order to:

AMERICAN ELECTROPLATERS' SOCIETY, Inc.

American Building • 443-445 Broad Street • Newark 2, New Jersey

AES LAPEL BUTTONS

The AES member's handsome sterling silver lapel button can be purchased from your Branch Secretary at $1.38 per button including tax. These, in turn, can be purchased by Branch Secretaries from National Headquarters at that amount. The sterling silver Branch Past President's button can be purchased by Branch Secretaries from the National Office at $1.43 per button including tax.

For cleaning these sterling silver buttons, here is one expert member's reported method, "Place hot water in which a little washing soda has been dissolved into an aluminum pan or any container with a small piece of aluminum at bottom (concentration: one tablespoonful of soda to one quart of water). Immerse the button so as to touch aluminum, and allow to soak until tarnish disappears. Operation will clean but will not injure the silver."

DIRECT MAIL SERVICE FOR PLATING MAGAZINE ADVERTISERS

Neither AES's membership directory nor PLATING MAGAZINE mailing list are released to anyone for any purpose. As an accommodation to PLATING MAGAZINE advertisers wishing to link their PLATING product advertising with direct mail promotion, however, PLATING maintains a direct mail service featuring the largest audited paid circulation in the electroplating, metal finishing and allied arts field.

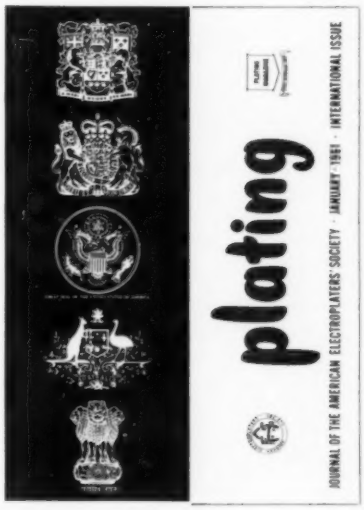
A bonafide example of the advertiser's proposed mailing must first be received and screened by PLATING. If mailing assignment is accepted thereby, the entire quantity must be shipped by the advertiser to PLATING MAGAZINE's Newark, N. J. office, pre-stuffed, for PLATING addressing and mailing. No mailing of less than a thousand pieces is acceptable. For further, fuller details, including costs, write or call Thomas W. Lowe, Production Manager, PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J. (Telephone HUmboldt 2-3400).

PLATING MAGAZINE TECHNICAL ARTICLE REPRINTS AVAILABLE

To maintain PLATING MAGAZINE's high standard, each and every technical article that you read in PLATING has been critically appraised and approved by a panel of experts on that specific subject before PLATING acceptance for publication.

If desired, you can, at nominal cost, order a quantity of reprints of any published PLATING technical article. Minimum order is 100 copies. Ask for further, fuller purchase details, including cost. In this connection, write or call Thomas W. Lowe, Production Manager, PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J.

VALUES AVAILABLE TO AES NON-MEMBERS



THE EASY WAY TO OBTAIN AES MEMBERSHIP INFORMATION OR TO SUBSCRIBE TO PLATING MAGAZINE. JUST FILL IN AND MAIL TODAY. ——→

This issue of PLATING MAGAZINE that you are reading is a typical edition reaching every member in good standing of American Electroplaters' Society, Inc. (AES) monthly, plus a large and growing number of AES non-members internationally who subscribe to it year after year because they like its values. That's why half-century old PLATING serves the largest audited paid circulation in this field and has the highest audited percentage of paid subscription renewals in the electroplating and metal finishing field.

As an AES non-member, you too can enjoy PLATING MAGAZINE monthly either 1) by joining one of AES's 61 Chartered Branches in the United States, Canada and Australia (or Membership-at-Large if no such Branch exists in or near your home community) and reaping the many ADDITIONAL benefits of such membership, or 2) by subscribing to PLATING MAGAZINE direct at a domestic subscription cost to you of $5.00 per year, $8.00 foreign. The box below is for your convenience either in obtaining information concerning AES membership or in subscribing to PLATING MAGAZINE.

PLATING MAGAZINE
American Building
443–445 Broad Street
Newark 2, New Jersey

EXECUTE 1 or 2 and MAIL TODAY

1. Send me information concerning AES membership.....

2. Enter my subscription to PLATING MAGAZINE for one year effective .....and bill me at the annual rate of $5 domestic or $8 foreign.....

.....
(PRINT NAME)

....
(DATE) (PRINT ADDRESS)

INTERSOCIETY NEWS

CHEMICAL EXPOSITION WILL SHOW NEW PRODUCTS

New ways to reduce manufacturing costs will be the principal contribution of the 28th Exposition of Chemical Industries to the national economy.

The Exposition, largest since its inception in 1915, taxing the capacity of the New York Coliseum, November 27 to December 1, with some 535 displays of materials, equipment and supplies for every phase of chemical processing, will portray all the new products that have come forth from the ceaseless quest for advancement since the last exposition in New York, two years ago. With few exceptions, new products are in the American tradition that spares no dollars to provide the means to better products, costing less to make.

While it is in fact a display of new products, the underlying purpose of the Exposition, and its major influence, is to strengthen the community of interest between exhibitors and their customers, who are drawn from every conceivable avenue of industrial activity. To this end they go beyond the mere display of new products to cooperate in consumers' product improvement.

From this effort come offers to test consumer's products in the exhibitor's own laboratories and plants, assist in development work and carry out pilot operations. Thus the Exposition becomes the background for an all-industry conference on chemical engineering design and chemical processing.

♦

PLANT ENGINEERING SHOW IN PHILADELPHIA

The next National Plant Engineering & Maintenance Show will occupy the largest exhibit area in its history, according to producers of the exposition. Now in its 13th year, the show will return to the East Coast in 1962, when it will take place at Convention Hall, Philadelphia, January 22 through 25, 1962.

More than 400 companies are expected to exhibit. About 350 already have been assigned booth space. Among the exhibits will be many new and significantly improved products, including air conditioning, heating and ventilating equipment; building services and materials; communications systems; electrical equipment; instruments; inventory and work control systems; lubricants and lubricating equipment; maintenance tools and supplies; management services; materials handling equipment; plant furniture; plant protection equipment; pollution control equipment; plumbing equipment; power generation and distribution equipment; product finishes and finishing equipment; safety equipment; sanitation and cleaning equipment, storage equipment, and welding equipment.

Concurrently with the show, the 13th annual Plant Engineering & Maintenance Conference also will be held at Convention Hall. Like the show, the conference will be expanded to meet current needs.

Visitors may obtain show, conference and hotel information from Clapp & Poliak, Inc., 341 Madison Av., New York 17, N. Y. Rapid registration cards, to save time in registering for the show, and inquiry time saver plates, to assist visitors in obtaining further information, sales calls and literature, may be obtained from the same source.

Special buses will operate from major downtown hotels to Convention Hall during the show and conference.

♦

IMF ANNOUNCES STUDENTS COMPETITION

The North West Branch of the Institute of Metal Finishing, England, is holding an international students paper competition (age limit 25 years).

The subject matter is left entirely to the author the only proviso being that it should be allied to the Art and Science of Metal Finishing. Papers submitted can vary from the academic to the most practical, thus allowing the apprentice at shop floor level and the college student to participate on equal terms.

This competition is open to all students whether a member of the Institute or not.

Judges will take into consideration the following points: (a) Presentation, (b) Age, (C) Education and Training, (d) Originality, (e) Clarity of statement, (f) Importance of Subject as allied to present day Metal Finishing technique.

Prizes value between £5 and £10 ($14.00 and $28.00) in the form of vouchers to enable winners to select books, apparatus or equipment of their choice. Winning papers will be published in the technical press if the required standard is reached.

Notification of winners by March 1, 1962. Papers will be read in abstract form at our April 5 technical meeting at the Engineers Club, Albert Square, Manchester, at which time prizes will also be presented.

Prizes will be awarded as follows: (1) Best all around paper, (2) Best Organic paper, (3) Best Electrochemical, chemical or allied subject paper. (this can of course include polishing, cleaning, pickling, etc.) (4) Best Practical Paper, (5) Best paper under the age of 20.

Further prizes may be awarded should the Judge decide papers of outstanding merit justify it. Choice of subject is left to the author, and lines of script must be double spaced.

The closing date for the competition is December 31, 1961. Entry blanks can be obtained from F. Spicer, Hon. Secretary, Institute of Metal Finishing, North West Branch, Suffield Cottage, Moorhead, Gildersome, Nr. Leeds, England.

♦

NEW NAME FOR ASTM

The name of the American Society for Testing Materials was officially changed to the American Society for Testing AND Materials with the signing of a court decree on September 18, 1961, amending the Society's Charter originally granted in 1902 by the Commonwealth of Pennsylvania.

In announcing this change, ASTM President Miles N. Clair said, "The inclusion of the word 'and' in the Society's name places added emphasis on the Society's research work in seeking knowledge of the nature of materials.

The change in name was the result of study and discussion with members throughout the country extending over several years. It was also given careful consideration by the ASTM Board of Directors prior to its approval and adoption by the membership at the Annual Meeting, June, 1961.

"Although a number of other suggestions for a new name were given serious consideration," continued Mr. Clair, "there was strong agreement among the membership that there should be a minimum disturbance of the name. In addition there was unanimous agreement that the initials 'ASTM' and the Society's symbol incorporating these initials . . . should be unchanged."

♦

ASTM PUBLICATIONS LIST AVAILABLE

The American Society for Testing Materials announces the availability of a 62-page list of publications. Published in April of this year, this list of publications describes the symposiums, manuals, special publications, indexes, compilation of standards, charts, reference photographs and reports published by the society through the years. More than 300 items are fully described, 40 of which are new.

The publications cover all phases of materials and their evaluations and are arranged conveniently by titles and subject. A convenient order blank is bound into the catalog. The list of publications may be obtained free for the asking from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

♦

100 PAPERS TO BE PRESENTED AT SPE CONFERENCE

"Plastics Revolutionize Design" is the theme for the 18th Annual Technical Conference of the Society of Plastics Engineers, to be held at the Penn-Sheraton Hotel in Pittsburgh, January 30 through February 2, 1962.

Highpoint of the Conference will be a technical paper to be presented by Professor Guilio Natta of Montecatini in Milan, Italy. His subject will be "Progress in Stereo-Regulated Polymers." Approximately 100 additional papers will be read.

Technical areas to be covered in the more than 26 sessions include new plastics formulations such as polyolefins, urethanes and polystyrenes (processing, properties and applications), reinforced plastics (uses and new developments in testing), and plastics-metals combinations. Other topics for discussion under plastics process technology are injection molding and extrusion, fast-moving blow molding and thermo-forming, and auxiliary plastics processing equipment.

As in conferences before, technical sessions will be terminated in mid-afternoon to permit ample time for the annual meetings of the Society's sixteen Professional Activity Groups, where final reports will be submitted on 1961 accomplishments and programs formulated for the coming year.

Remittance must accompany all book orders placed with AES Headquarters.

1961 Book of ASTM Methods for Chemical Analysis of Metals—Committee E-3. Cloth Cover, 6 by 9, 722 pp. AES Non-members $11.00; AES Members $10.00.

The 1961 Book of ASTM Methods for Chemical Analysis of Metals is the latest volume in the series published by the American Society for Testing Materials, providing an authoritative source of reliable and accurate methods of analysis, and supplemented by many new testing procedures perfected and approved by Committee E-3 on Chemical Analysis of Metals.

Among the topics covered are: sampling methods, chemical analysis of ferrous and non-ferrous metals, analysis of metal powders, and spectrochemical and microchemical analysis methods. Included is a very detailed index arranged to provide maximum serviceability. There is also data on standard samples of metals issued by the National Bureau of Standards.

The volume contains various methods included in previous editions which have been brought up-to-date, newer methods that take advantage of shorter or more precise procedures which have been developed, and methods for additional metals.

CHANGED YOUR ADDRESS LATELY?

To insure prompt and uninterrupted servicing of your PLATING MAGAZINE, please fill out this form (Print or type) and mail to PLATING, 443-445 Broad Street, Newark 2, N. J.

NAME.....

OLD ADDRESS.....

CITY.....STATE.....

NEW ADDRESS.....

CITY.....STATE.....

EMPLOYED BY.....

.....

YOUR FUNCTION.....

NEW DAVIES PLATING CONSOLE

Why laboriously assemble your own installation for plating printed circuits, electronic components and precious metals—when you can have a Davies self-contained console?

Just set the Davies Console in position, make one power, water and drain connection—and start plating.

Nothing else to do, because Davies did it all—tank construction, coating, internal utilities . . . the works.

Write today. Tell us your R&D or production needs. We'll offer design suggestions, free.

Davies
Supply & Manufacturing Co.
4160 Meramec Street • MOhawk 4-9332
St. Louis 16, Mo.

Branches: 814 W. 17th St. Kansas City 8, Mo. | 2547 Farrington Dallas 7, Texas | 1395 W. Quincy Englewood, Colo.

INDUSTRY NEWS

CLARK-COOPER NAMES THREE REPS

The Clark-Cooper Division of Frederic B. Stevens, Inc., Palmyra, New Jersey, has appointed three new representatives to handle its line of precision metering pumps for measuring and transferring all types of liquids, slurries and suspensions.

Reed Harr Associates, 3517 Hennepin Avenue, Minneapolis, is the new representative for Clark-Cooper pumps in the State of Minnesota.

William B. McNew & Associates, flow equipment engineers since 1952, will now handle Clark-Cooper pumps in Northern California. They are located at 275 Brannan Street, San Francisco 7.

The Bogart-Bullock Corporation, 6010 S. Normandie Avenue, Los Angeles 44, which has been handling flow engineering problems since 1951, will now be the Clark-Cooper representative in Southern California, Nevada and Arizona.

♦

PLATRONICS NOW REPRESENTED NATIONALLY

With negotiations for representation on the West Coast completed, Platronics, Linden, New Jersey, precious metals platers for the electronics industry, announces they are the first enterprise of its kind to offer nation-wide representation and local technical assistance throughout the country.

According to John Palumbo, secretary and general manager, the credentials of hundreds of manufacturers' representatives were screened, and dozens of interviews were conducted over the past year.

♦

OSTRANDER TOURED EUROPEAN ALLIED LICENSEES

Charles W. Ostrander, technical assistant to the president, Allied Research Products, Inc., Baltimore, Maryland, recently completed an extensive 7-week tour of Europe, visiting Allied Research licensees and their customers. Working in cooperation with Sture Granberger, the Allied Research foreign agent for the European countries, Mr. Ostrander made calls in Sweden, West Germany, Italy, France, England and Switzerland.

While in Switzerland, Mr. Ostrander, a member of the American Electroplaters' Society, presented a paper "Chromate Conversion Coatings for Hot Galvanized Surfaces." This was given at the 6th International Galvanizing Conference held in Interlaken under the auspices of the European General Galvanizers Association.

Mr. Ostrander, in addition to acting in the capacity of foreign liaison for Allied Research operations in Sweden, England, Germany, Italy, Australia, Japan, India, France, the Benelux countries and New Zealand, also acts as technical liaison between the company's sales department and product development group and is responsible for the company's patent work.

Currently, Mr. Ostrander has been given the special assignment of investigating the sales and technical problems associated with a new line of metal finishing products being developed by Allied Research.

♦

METAL & THERMIT AND UDYLITE PROPOSE MERGER

H. E. Martin, chairman of Metal & Thermit Corporation and L. K. Lindahl, chairman of The Udylite Corporation of Detroit, Michigan, have announced approval in principle by both boards of directors of a merger between the two companies.

The action is subject to approval by the directors of a formal merger agreement for submission to the stockholders of M & T and Udylite.

Udylite will continue under its present management as a division of Metal & Thermit Corporation.

Under the proposed terms, each share of Udylite stock would be exchanged for 0.65 shares of M&T's stock. M&T's present common stock will continue, share for share, as common stock of the combined enterprise.

Holders of M & T outstanding $50 par value, 7 per cent preferred stock may elect to receive 3½ shares of common stock or one share of new $50 par 7 per cent preferred stock for each share now held. The new $50 par preferred stock will carry a $3.50 annual dividend and be convertible through 1964 into common stock at current market value at the time of conversion, each converted share of preferred to be taken for this purpose at $75, but in no event more than 2½ shares of common stock. It is intended that the common stock be placed on an annual dividend basis of $1.50 for the year 1962. M&T's common stock is presently listed on the American Stock Exchange and Udylite's on the New York Stock Exchange. Following the merger, application will be made to list the common stock of the combined enterprise on the New York Stock Exchange.

Metal & Thermit is a chemically orientated company whose diverse operations include chemicals, coatings, minerals, chromium plating processes and materials, welding equipment and detinning.

Metal & Thermit increased its income 8.3 per cent in 1960, despite a slight sales decline due to decreased volume in the detinning and welding divisions. Net sales for the year ending December 31, 1960 were over $40 million, with a net income of over $1,700,000. Earnings per common share were $2.10.

Udylite reported net sales and other revenue of over $52 million for 1960. Consolidated net income for the year ended December 31, 1960, amounted to over $1 million, equivalent to $1.16 per share. In 1960 Udylite sold a division of its company. Net sales and other revenue, apart from this division, approximated $37,500,000 and net income for the year, before deducting loss arising from the sale of the division, was $1.47 per share.

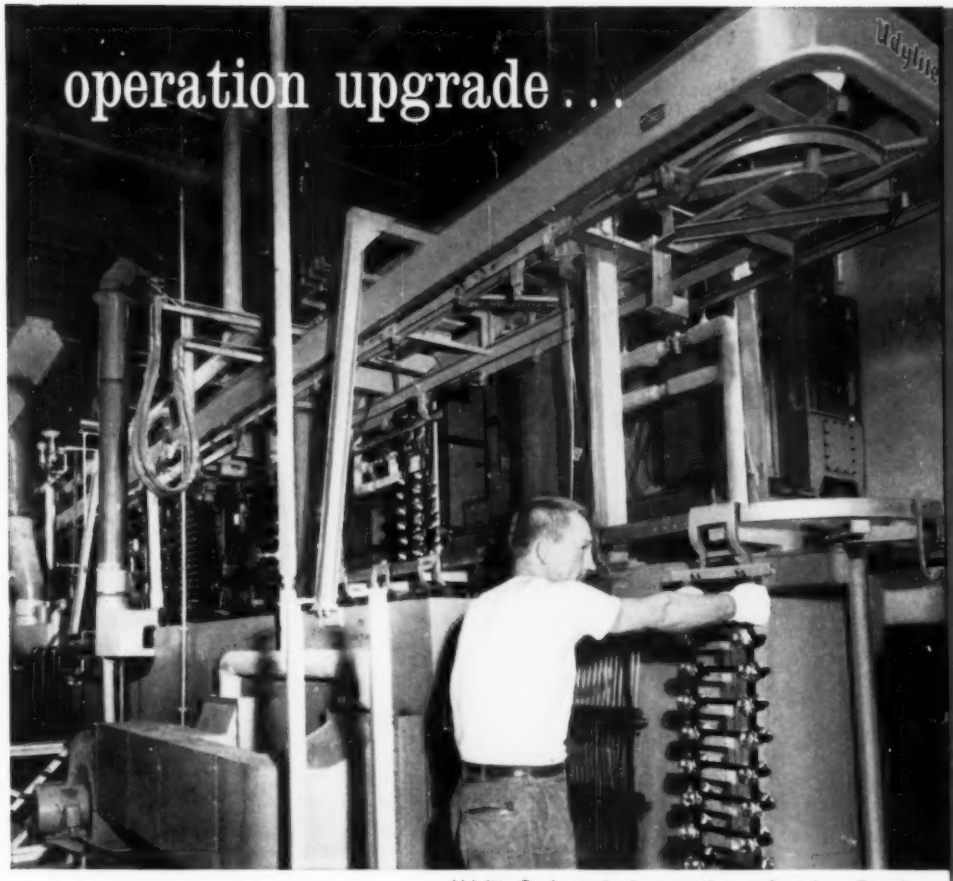
Today, Udylite products are sold in 20 foreign countries on six continents under exclusive licensing arrangements.

M&T has a broad international representation. In addition to its Canadian chemical and detinning manufacturing it has manufacturing facilities in several foreign countries and also sells chemical products in some 30 major foreign markets.

♦

DIAMOND ALKALI PARTNER IN NEW SOUTH AMERICAN PLANT

Construction of the largest electrolytic caustic-chlorine plant in South America has been announced by Diamond Alkali International Corporation, a wholly owned subsidiary of Diamond Alkali Company, Cleveland, Ohio. The large chemical plant, to be known as Carbocloro—Industrias Quimicas Ltda., will be owned and operated by Diamond in partnership with two Brazilian industrial groups, Quimica



Udylite Cyclemaster in operation at American Standard Plumbing and Heating Division, Cincinnati, Ohio

CYCLEMASTER has the answer

This Udylite Cyclemaster, which is another way to say low cost automation, represents six important areas of improvement in American Standard's plating production.

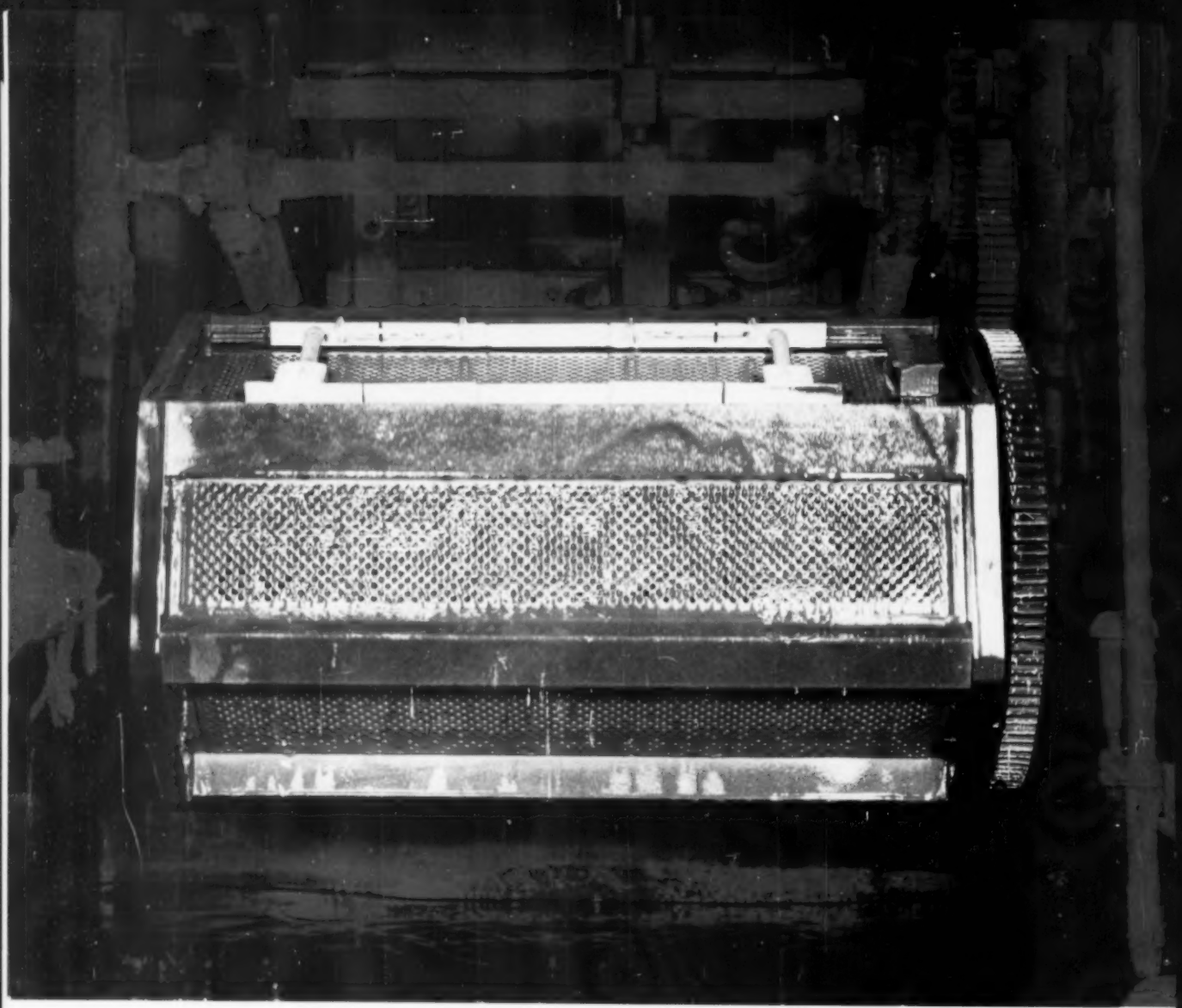
- quality control to meet their most exacting top standards
- production volume far exceeding their expectations
- nearly 50% savings in floor space used for the operation
- almost total elimination of rejected pieces
- ultra-sonic cleaning to eliminate complicated de-greasing
- Plastisol coated tanks for minimum maintenance . . . long life

Learn how Cyclemaster can perform with equally promising revisions of your profit picture while improving your product whatever it may be. To find out how so *much* can be accomplished for so *little*, ask your Udylite representative, today!

Udylite

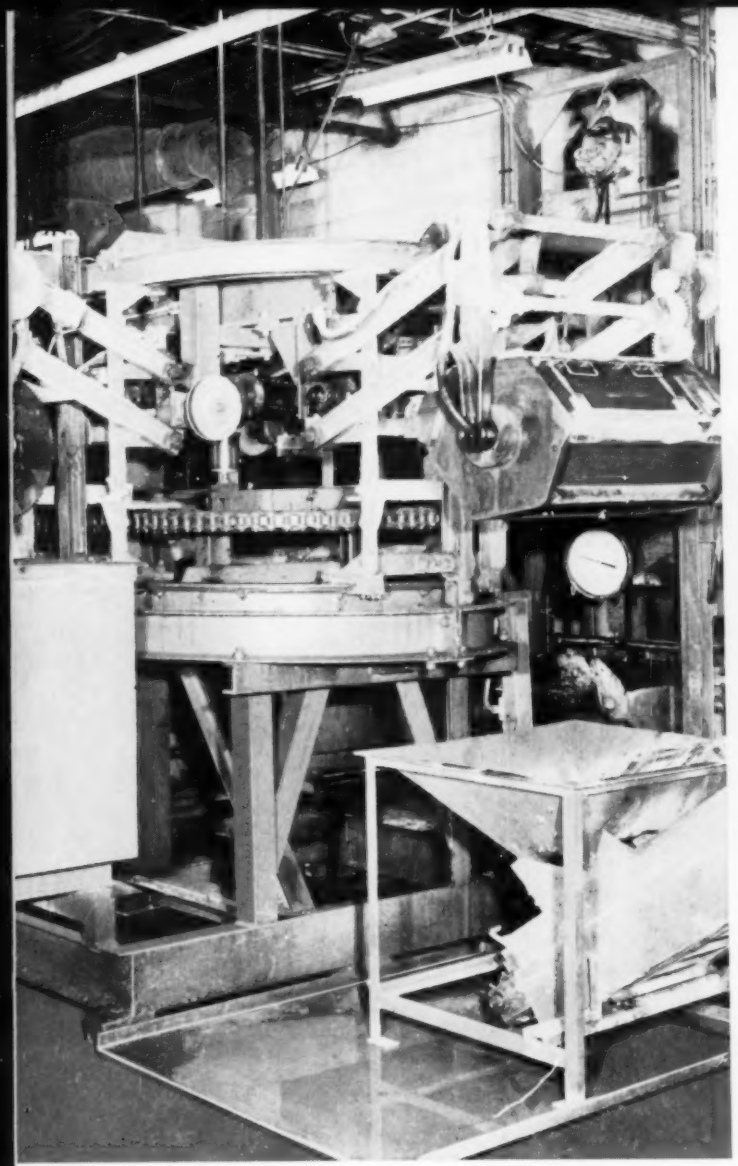
The Udylite Corporation
Detroit 11, Michigan

udylite



7 years of high-production service!

Udylite tempron plating cylinders take 200-pound loads, 10 times a day . . . year after year.



"Udylite Tempron Plating Cylinders give us more for our money: economical performance, low maintenance and extra long service life," says Al Betteley of the Bellevue Plating Co.

Al Betteley, Vice President and General Manager of Bellevue Plating, Detroit, Michigan, is more than satisfied with the performance and economy records set by Udylite Tempron Cylinders on his high-volume zinc plating operation. ■ "Rugged construction, maximum resistance to heat and abrasion, plus a design that practically eliminates maintenance problems, have made these Tempron Cylinders real cost-cutters in our plant," states Mr. Betteley. ■ Specializing in nut, fastener and automotive component plating, Bellevue Plating now has Tempron Cylinders in operation on two automatic barrel machine lines. Up to 200 pounds of parts per cylinder are processed at temperatures to 212° F.—then, they are immediately placed in a cold rinse. Lack of warping or softening at this great temperature variance makes Tempron Cylinders ideal for the plating job. ■ Look into the long range advantages of Udylite Tempron Cylinders on your plating and processing operations. You'll discover, just as Bellevue Plating has, that they'll give you more for your money year after year. Call your Udylite Representative today. Or, write direct for complete information:

Udylite

THE UDYLITE CORPORATION
DETROIT 11, MICHIGAN

YOUR BEST SOURCE FOR ZINC ANODES

The Udylite Corporation can readily fill all your zinc anode requirements from a network of warehouses across the country. Anodes are immediately available for shipment in these popular shapes and sizes:

BALL ANODES—2″ diameter.

OVAL ANODES—1½″ x 2½″ cross section; from 12″ to 36″ long.

OVAL ANODES—1½″ x 3½″ cross section; from 12″ to 32″ long.

HEX ANODES—1¾″ x 2¾″ cross section; from 12″ to 36″ long.

SLAB ANODES—1″ x 4″ cross section; from 12″ to 42″ long.

Oval, hex and slab anodes are available drilled and tapped or with steel strap hook through entire length of anode. Udylite anodes have the highest purity available, are of a special high grade zinc and meet all government specifications. Ball anode containers are manufactured in both straight and curved types. Call your Udylite representative the next time you order zinc anodes. Or, order directly from:

Udylite

world's largest plating supplier

THE UDYLITE CORPORATION

Detroit 11, Michigan

udylite

Industrial Medicinalis, S. A. and Brazil Warrant Cia. de Commercio e Particicipacoes. Italian interests represented by Ibis International Industrial Investments, Inc. will also be associated as partners with the new chemical complex. Initial stages of the program call for investment of $15 million.

The plant, scheduled to go on stream in 1963, will be located in Cubatao, Brazil, one of the most rapidly expanding industrial areas in South America. Chlorine, caustic soda, hydrochloric acid and dicalcium phosphate will be produced initially. The design capacity is 90 tons of chlorine and 100 tons of caustic soda a day, with provisions to double this production. Future plans include upgrading the chlorine into additional related products.

♦

UNION CARBIDE LICENSES SILICONE FINISH

Union Carbide Corporation has granted a license to Keystone Silver Company, Philadelphia, to apply its new silicone anti-tarnish finish to silver hollowware, under terms of an agreement just completed. The silicone finish, called Invicta, will be applied at the factory by Keystone to existing silver articles.

The Invicta finish is the result of ten years research and development by the Silicones Division of Union Carbide. Silver treated by the process in 1956 reportedly has withstood all tests and still retains a high polish.

The article to be treated receives a chemical silicone coating less than one ten-thousandths of an inch thick and is completely invisible, yet is claimed to be so tough that it resists the most obstinate stains, including salt and sulfur.

♦

KRIER TELLS NEED FOR PROTECTIVE COATINGS

Protective coatings to safeguard tungsten, tantalum, molybdenum, and columbium alloys from the destructive effects of oxidation must be developed before these refractory metals can assume a prominent role in nuclear and space technology. This is the opinion of Dr. C. A. Krier writing in the June *Battelle Technical Review*.

According to the Battelle Memorial Institute scientist, these principal refractory metals, which are highly rated for their other properties, are among the least resistant to destructive oxidation at high temperatures. Unlike most oxidation-resistant metals, the principal refractory metals do not form their own protective oxide coatings.

Present research and development efforts are concentrated in two areas: (1) finding materials which are both oxidation resistant and compatible with the metal to be protected and (2) developing processes to apply the coatings.

"There is not now and probably will never be a universal coating that will provide oxidation resistance to all structural refractory metal alloys in all of the contemplated applications," says Dr. Krier.

In his article Dr. Krier discusses a number of coatings and methods of application for various metals and environmental conditions.

A "promising system" for protecting molybdenum for 50 to 100 hours at 2000 to 2500 F is aluminum oxide flame-sprayed over chromium plate. An "interesting system" for protecting columbium under the same conditions is glass-impregnated aluminum oxide applied by flame spraying.

For service of several hours at temperatures of 2500 to 3000F, promising systems are listed only for molybdenum and columbium.

Electroplated platinum and flame-sprayed aluminum-silicon are listed as interesting systems for protecting molybdenum at 2500 to 3000F temperatures.

According to the Battelle scientist, considerable additional research and development are required before promising systems for temperatures over 3000F will become available.

MANHATTAN RUBBER LINING PROTECTS COSTLY PICKLING AND PLATING EQUIPMENT ...*Permanently*

STOP CORROSION STOP CONTAMINATION

Photo courtesy Hanson-Van Winkle-Munning Co.

- THICK, MULTIPLE CALENDERED SHEETS
- INSEPARABLE RUBBER-TO-METAL BONDS
- ELIMINATE DANGEROUS "STRAY CURRENTS"
- NATURAL OR SYNTHETIC RUBBER
- WON'T HARDEN, CRACK OR OXIDIZE
- TESTED UNDER HIGH VOLTAGE

Be *certain* of lifetime protection for your costly equipment and protection against contamination of expensive plating baths. Specify Manhattan lining on your next tank lining job.

MANY MANHATTAN LINED TANKS HAVE BEEN IN CONTINUOUS USE OVER 30 YEARS!

ENGINEERED RUBBER PRODUCTS .. MORE USE PER DOLLAR

RM

Rubber Lining Plants at Passaic, N. J. • North Charleston, S. C. • Neenah, Wis.

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

RMI038-R

ACOUSTICA ULTRASONICS MAY CLEAN YOUR PRODUCT 18 TIMES FASTER!

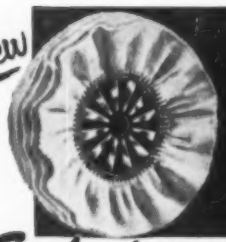
An Acoustica ultrasonic cleaning system is the *fast* way to clean your products—no matter how dirty or complex they may be. For instance, ultrasonics reduces cleaning of ball bearing assemblies for one company from a 12-minute manual operation to a mere 40-second dip. An Acoustica cleaning system will save you time, money and manpower—and give you super-clean results! Write for free case histories.

COMPLETE LINE OF VACUUM-TUBE AND TRANSISTORIZED CLEANING SYSTEMS. WE INVITE YOUR REQUIREMENTS FOR CUSTOM-DESIGNED UNITS.

acoustica
GENERAL ULTRASONICS DIVISION
10400 Aviation Boulevard, Los Angeles 45, Calif.
463 Old Country Road, Westbury, L.I., N.Y.

COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 2,873,392; 2,947,899; 2,956,196; 2,956,789 AND BY FOREIGN PATENTS. OTHER U.S. AND FOREIGN PATENTS PENDING.

New



"GOLDEN TACKY"
treatment for Cotton or Sisal Buffs

Exclusive **with American Buff**

Provides firmer buff body • Eliminates loose, frayed fibre ends • Increases buffs ability to hold compound • Makes buffs wear longer and cut harder • Gives better finishing in fewer passes

Get the facts now — write

American Buff Company
2414 S. LaSalle St. • Chicago 16, Ill.

Send Your REALLY TOUGH
Racking Problems to:

RACK SPECIALISTS
PLATING — ANODIZING
DEGREASING — PAINTING

MITCHELL-BATE CO.
APPLICATORS OF PLASTISOL
1040 SOUTH MAIN ST. • WATERBURY, CONN.

INDUSTRY NEWS BRIEFS

CHEMICAL CONTOUR AWARDED CHEM MILLING CONTRACT

The Boeing Co., Seattle, has awarded a $600,000 contract to Chemical Contour Corporation, Gardena, Calif., for the chemical milling of structural parts for the Boeing 727 commercial jet transport.

Chemical Contour will do the work at its Gardena facility and first finished parts will be delivered to Boeing before the end of this year. Under this first production increment contract, Chemical Contour will perform chemical milling on aluminum wing components. This marks the first major structural application of chemical milling in the production of Boeing's commercial aircraft.

♦

VARLAND TO BUILD KENTUCKY PLANT

Varland Metal Services, Inc., of Cincinnati, will erect a new 10,000-sq ft electroplating plant at Frankfort, Ky., it has been announced by Curtis M. Varland, president. The plant will employ approximately 25 persons.

The Varland company does electroplating and metal finishing work for firms in southern Ohio, Kentucky and neighboring states.

♦

MINES BUREAU RESEARCH TO INCLUDE ULTRASONICS IN ELECTRODEPOSITION

The Department of the Interior has disclosed that the Bureau of Mines research for lead and zinc during the 1962 fiscal year will cover both mining and metallurgical phases. An important part of the metallurgical research program will be studies on operation techniques, which will include the application of ultrasonics in electrodeposition of metals.

♦

REVISED ASA HARDNESS CONVERSION TABLES

A revised American Standard on hardness conversion tables for metals, replacing three American Standards approved in 1955, has been reported by the American Standards Association.

Developed and published by the American Society for Testing Materials, "American Standard Hardness Conversion Tables for Metals (ASTM E140-58) Z76.4-1961" replaces American Standards Z76.1-1955, Z76.2-1955 and Z76.3-1955.

The newly revised standard, Z76.4-1961, specifies the relationship between Brinell hardness, diamond pyramid hardness, Rockwell hardness and Rockwell superficial hardness of carbon, alloy and tool steels, nickel and high-nickel alloys and cartridge brass. Six hardness conversion tables accompany the text.

Copies of the revised standard are available at 30 cents each from the American Standards Association, Dept. P245, 10 East 40th Street, New York 16, N. Y., or the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

♦

CUSTOM APPLICATOR IN MICHIGAN FOR M&T SPRAYABLE PLASTISOLS

Installation of complete custom facilities for the spray application of plastisol coatings to a wide variety of large industrial tanks and equipment has been announced by the G-N Equipment Company, Grand Rapids, Michigan.

Long experienced in the application of M&T Unichrome plastic coatings to equipment for the plating industry, the company has now expanded its operations to serve other industries as well. The installation of a new oven, measuring 40 by 10 by 12 ft, makes it possible for G-N to handle large industrial units, such as tanks, fume ducts and other equipment that must be protected against corrosive liquids or fumes with a firmly-bonded, seamless coating.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D.C. Price 25 cents each.

2,977,204, 3/28/61—IMPROVING CORROSION RESISTANCE OF ZIRCONIUM—D. Shannon, assignor to U.S.A. (AEC).

Immerse the object in 39 per cent of 70 per cent HNO_3 4 per cent of 48 per cent HF, and 4 per cent of HF of 48 per cent HF and 57 per cent of deionized water, followed by a rinse in 15 per cent $Al(NO_3)_3 \cdot 9H_2O$, a rinse in 0.1 to 1.0 *N* nitric acid, in tap water and finally in deionized water.

3 claims.

♦

2,977,241, 3/28/61—ENAMEL PROCESS—E. Oliver et. al., assignors to General Electric Co., New York.

Claim 1 reads: "The method of treating a steel surface for application of a single finish coat of enamel which comprises the steps of cleaning said surface by means of an alkali cleaning solution containing from 10 to 30 per cent phosphoric acid and having a controlled ferrous ion content of from 0.01 to 1.0 per cent by weight and a ferric ion content of from 0.05 to 3.9, to remove from the surface from 1.5 to 3.0 grams of iron per square foot of exposed surface, washing the pickled surface with a weak alkaline solution to remove therefrom phosphate coating formed during pickling of said surface, subjecting said washed surface to the action of a hot nickel sulfate solution containing from 1 to 4.0 ounces per gallon $NiSO_4 \cdot 7H_2O$ and 0.001 to 0.03 per cent by weight of phosphate ions until there is obtained on said surface a nickel flash coating between 0.02 and 0.35 grams per square foot of surface, rinsing the nickel coated surface with an alkaline neutralizing or inhibiting solution and then with clear water before drying said surface in preparation for the application of a one-coat porcelain enamel."

2 claims.

♦

2,977,244, 3/28/61—COPPER DEPOSITION—S. Kay and R. Ball, assignors to Pilkington Bros. Ltd., Liverpool, England.

Spray an aqueous complex cuprous salt solution and an aqueous acid solution simultaneously into a silvered surface so as to mix the two solutions.

17 claims.

♦

2,977,251, 3/28/61—PROTECTIVE COATING—J. Long and J. Furth, assignors to Solar Aircraft Co., San Diego, Calif.

A method of coating with an aluminum cermet coating having both metallic and ceramic phases is claimed.

22 claims.

♦

2,977,259, 3/28/61—INHIBITING WHITE RUST—L. Schmelzer, assignor to U. S. Steel Corp., New Jersey.

A method for the treatment of galvanized articles to inhibit the formation of white rust comprises immersing the articles in a solution containing 0.1 to 0.5 per cent of Na^+, K^+ of NH_4^+ dichromate followed by immersion in a 0.1 to 0.6 per cent solution of fluoborate solution and 0.1 to 0.4 per cent of dichromates at a *p*H of 4 to 6.

2 claims.

♦

2,977,260, 3/28/61—INHIBITION OF CORROSION OF ALUMINUM ALLOY—G. Biefer and F. Krenz, assignors to Atomic Energy of Canada, Ottawa, Canada.

Al-Ni alloys containing 0.5 to 5 per cent nickel are brought into contact with a silicic acid-deionized water solution in which the silicic acid is 100 p.p.m. and the *p*H is not less than 5.0.

7 claims.

♦

2,977,294, 3/28/61—ANODIZING ALUMINUM—J. Franklin, assignor to Sandford Process Co., Inc., Los Angeles, Calif.

Anodize in a 16 to 20 per cent 66Be sulfuric acid containing an oxide coating accelerator until a coating of at least 0.0005 in. is formed, then anodize in a 7 to 12 per cent 66Be sulfuric acid and an accelerator until the desired coating is formed.

16 claims.

♦

2,977,295, 3/28/61—ZINC PLATING—C. Cooper, Grass Lake, Mich.

To plate zinc on Al, Mg and steel use a solution containing at least 10 g of zinc/liter and 10 g of titanium/liter in a fluoborate bath.

14 claims.

♦

2,977,296, 3/28/61—PRESERVATION OF CUT FLOWERS—W. Ryan, 3084 S. 40th St., Omaha, Nebr.

To provide a water stream for the preservation of cut flowers insert a pair of electrodes (90 per cent Ag and 10 per cent Zn) and apply a direct voltage sufficient to dissolve the electrodes at the rate of 1–500 ppm in the water flowing through.

3 claims.

♦

2,978,361, 4/4/61—SURFACE TREATMENT OF METALS—A. Lam, assignor to DEGUSSA, Frankfurt am Main, Germany.

Claim 1 reads: "A process for the surface treatment of metals which comprises applying a coating of an alkaline aqueous solution of an alkali metal silicate in which the proportion of alkali metal oxide to silicon dioxide is 1:2.5 to 1:5 and 0.05 per cent to 2 per cent, based upon the weight of the alkali metal silicate, of at least one heavy metal in the form of an alkali stable and water soluble compound over the metal surface to produce a non-crystalline silicate containing coating, drying the coating and heating the coating to a temperature between 100 and 400C."

See also 2,978,363 assigned to DEGUSSA with 4 claims.

9 claims.

♦

2,978,390, 4/4/61—GOLD PLATING—A. Atwater, assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

The preparation of a gold plating solution by adding phosphoric or fluoboric acid to a $K\,Au(CN)_2$ solution in an amount to adjust the *p*H to 1.8 is claimed.

8 claims.

♦

2,978,391, 4/4/61—NICKEL PLATING—A. Du Rose, assignor to Harshaw Chemical Co., Cleveland, Ohio.

Claim 1 reads: "A nickel electroplating bath comprising an aqueous solution of a nickel electrolyte selected from the group consisting of nickel sulfate, nickel chloride, and mixtures thereof, said solution also containing cooperating brightening addition agents, one of said brightening addition agents being at least one organic compound selected from the group consisting of aromatic and unsaturated aliphatic sulfonates, sulfonamides and sulfimides and the second of said brightening addition agents being a compound of the formula $A—S—(CH_2)_nCN$, wherein n is an integer from 1 to 4 and A is selected from radicals of the class consisting of:

$NC(CH_2)n$; $NC(CH_2)_n S(CH_2)_m$

m being an integer from 1 to 4; alkyl, 1 to 4 carbon atoms; alkenyl, 1 to 4 carbon atoms; alkynyl, 1 to 4 carbon atoms; $R_2NC_nH_{2-}$, where R is chosen from alkyl, alkenyl and alkynyl radicals of from 1 to 4 carbon atoms;

$$R_2N—C\overset{-}{=}\overset{-}{N}—R$$

where R is independently chosen from alkyl, alkenyl, and alkynyl radicals of from 1 to 4 carbon atoms; and compounds corresponding to the foregoing compounds wherein OCH_2CH_2 has been substituted for $(CH_2)_2$, the first said brightening addition agent being present is in said solution to the extent of from 0.05 to 20 grams per liter and the second said brightening addition agent being present in said solution to the extent of from 0.0001 to 0.015 gram per liter."

8 claims.

♦

2,978,858, 4/11/61—TUMBLE FINISHING—K. Gleszer, assignor to Dixon Sentaloy, Inc., Stamford, Conn.

Tumbling work-pieces with pellets of a sintered powdered metal is described.

1 claim.

♦

2,979,387, 4/4/61—ETCHING—J. Easley and C. Hopkins, assignors to Dow Chemical Co., Midland, Mich.

Etching of a magnesium (or alloy) photoengraving plate is described.

21 claims.

♦

2,979,430, 4/11/61—HEAT RESISTANT COATINGS—H. Keller and K. Lampatzer, assignors to Parker Rust Proof Co., Detroit, Mich.

The formation of heat-resistant phosphate coatings is described.

4 claims.

♦

2,985,567, 5/23/61—BLACK CHROMIUM COATINGS—H. Pinkerton, assignor to Allied Chemical Corporation, New York, New York.

A chromic acid bath (at least 60 g/l CrO_3) containing a fluoride catalyst (1:125 to 4000) at 75 to 450 asf at 70 to 100F yields adherent black chromium deposits.

7 claims.

♦

2,986,482, 5/30/61—PHOSPHATING COMPOSITION—J. Sharp, assignor to Canadian Industries, Ltd., Montreal, Canada.

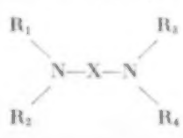
An anhydrous composition suitable for cleaning and phosphating metals consists of a chlorinated hydrocarbon containing 1 to 10 per cent of a sorbitan monoester and 1 to 6 moles of phosphoric acid per mole of sorbitan ester.

20 claims.

♦

2,986,498, 5/30/61—PLATING—W. Strauss and W. Willmund, assignors to Dehydag, Dusseldorf, Germany.

A brightener for copper, zinc, chromium and precious metal plating baths is an organic amino compound.



Where X is acyclic, cyclic or heterocyclic hydrocarbon radical.

11 claims.

2,986,499, 5/30/61—ELECTROPOLISHING STEEL—C. Wernlund, assignor to E. I. duPont de Nemours, Wilmington, Delaware.

A bath for electropolishing ferrous articles consists of 10 to 40 per cent water, 0.5–48 per cent fluoboric acid and the balance iron fluoborate.

4 claims.

♦

2,986,500, 5/30/61—NICKEL PLATING—F. Passal, assignor to Metal & Thermit Corporation, Woodbridge Township, New Jersey.

Claim 1 reads "In the process of electroplating nickel from nickel-containing baths, the improvement which comprises incorporation in said bath between 1 g/l and 25 g/l of a secondary brightener characterized by having at least one group selected from sulfone and sulfonic acid groups attached to a nuclear carbon of a homocyclic aromatic ring, and between 0.05 g/l and 1.2 g/l of N-vinyl-2-pyrrolidone, whereby lustrous nickel electrodeposits are obtained."

10 claims.

♦

2,986,501, 5/30/61—NICKEL PLATING—B. Martin, assignor to the McGean Chemical Company, Cleveland, Ohio.

Claim 1 reads "An electroplating bath for the production of bright level deposits of nickel, which comprises an aqueous acid nickel electrolyte solution containing a predominating amount of a soluble nickel salt and having incorporated therein a leveling and brightening agent selected from the group consisting of hydroxymethyl, hydroxyethyl and hydroxypropyl coumarin, wherein the substituent groups in said agent are attached to the coumarin nucleus in at least one of the 5, 6, 7 and 8 positions, said agent being present in solution in effective amount ranging from at least 0.05 g/l to the limit of its solubility."

♦

2,987,010, 6/6/61—CARRIER STOP—J. Choma, assignor to The Udylite Corp., Detroit, Mich.

A carrier stop for a work handling apparatus is claimed.

8 claims.

♦

2,987,417, 6/6/61—PIGMENTING ALUMINUM OXIDE COATING—W. Cochran, assignor to ALCOA, Pittsburgh, Pa.

Anodic coatings on aluminum can be pigmented by immersing in an aqueous solution containing chromic bisulfite, oxalate or formate.

9 claims.

♦

2,987,425, 6/6/61—PICKLING PROCESS—R. Shaw, assignor to ICI, Ltd., London, England.

Claim 1 reads: "A process of pickling metal which comprises providing an acid pickling solution, covering all of the surface of said solution with a non-aqueous surface layer of inert liquid which is substantially immiscible with said pickling solution and substantially non-volatile and stable at the operating temperature of said solution, including in said surface layer and said pickling solution a surface active agent which is soluble in both said layer and said pickling solution, thereafter passing the metal to be pickled through said surface layer and into said solution, withdrawing the thus pickled metal through said surface layer, and then rinsing said metal with water whereby the surface active agent in said surface layer facilitates the removal of any adherent surface layer."

See also 2,987,426 describing an alkaline metal treatment in 6 claims and a metal coating process (2,987,427) with 5 claims.

2 claims.

♦

2,987,428, 6/6/61—METAL COATING—F. Heller and R. Beamon, assignors to Amchem Products, Inc., Ambler, Pennsylvania.

Use

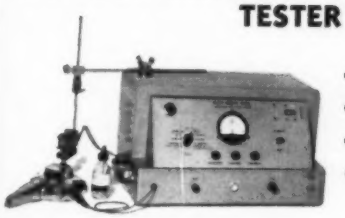
KOCOUR TEST EQUIPMENT

TO SOLVE YOUR

plating thickness problems!

You can depend on the . . .

KOCOUR ELECTRONIC THICKNESS TESTER MODEL 955



- direct reading
- virtually automatic
- 90-95% accurate
- simple operation

Wide Application Range!

Determines the thickness of brass, cadmium, decorative and heavy chromium, copper, lead, lead-tin, nickel, silver, tin, tin-zinc, and zinc deposits on various basis-metals. The thickness range is from 2–3 millionths up to 0.002". In addition, composite coatings can be tested. You get individual readings of the *actual* thickness of each deposit.

You can also test deposits on wire with Accessory Unit Model WT. (A.S.T.M. Spec. B-298-55T for testing silver coated copper wire.)

Dependable Accuracy!

Accuracy is 90–95%. Human error is virtually eliminated. A positive "Calibration" feature monitors both accuracy and performance.

Simple operation!

Just set up the specimen and press a button. The average test takes about 1 minute . . . readings are direct.

15 Day FREE trial!

Try it in your own plant for 15 days. See for yourself how it works . . . what it does . . . how well it suits your application. Your satisfaction is guaranteed.

FREE Evaluation of application

Just send us full details concerning your application including the plating/basis metal combinations and thickness range of each . . . or, just write for Bulletin 400. There's no charge . . . no obligation.

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

Write today for further information—no cost or obligation.

KOCOUR COMPANY

4801 S. ST. LOUIS AVENUE

CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.

A stud surface is treated with a solution of pyrophosphate (Na, K, NH_4, Li) 0.05 to 13 per cent and ferric ion, 0.0008 part to saturation of $P_2O_7^=$ and an accelerator (chlorates, nitrates, and peroxygen compounds).

3 claims.

♦

2,987,433, 6/6/61—CHROMIUM PLATING—Art DuRose, assignor to the Harshaw Chemical Company, Cleveland, Ohio.

The use of platinum plated titanium auxiliary anodes is claimed.

3 claims, figure.

♦

2,988,013, 6/13/61—INTERCHANGE DEVICE—J. Davis, assignor to the Udylite Corporation, Detroit, Michigan.

An apparatus to transfer racks between a conveyor and a loader is described. See also 2,988,014 assigned to Udylite describing a carrier stop in 5 claims and figure.

10 claims.

♦

2,988,465, 6/13/61—CONVERSION COATING—N. Newhard et. al., assignors to Amchem Products, Incorporated, Ambler, Pennsylvania.

Claim 1 reads "In the production of chemical conversion coatings on a succession of aluminum surfaces where the surface is treated with an aqueous acid solution consisting essentially of a fluorine bearing compound and hexavalent chromium, the method of maintaining the solution in coating condition throughout its operating life which comprises periodically restoring the hexavalent chromium content of the solution to the desired level and replenishing fluorine by adding fluoride from the class consisting of hydrofluoric acid and alkali and ammonium salts thereof, the quantity of fluoride from said class which is added being from 0.4 to 2 parts for each part of chromate (calculated as CrO_3)."

♦

2,988,492, 6/13/61—FERROCHROME PLATING—T. Yoshida, 15 Yarai-cho, Tokyo, Japan.

Iron-chromium alloys containing 5 to 40 per cent chromium can be plated from a bath containing per liter 37–200 gm $Cr_2(SO_4)_3$, 32–330 gm $(NH_4)_2SO_4$, 29–185 gm $FeSO_4$, 60–264 gm urea, and manganese or aluminum sulfate (0.0).

1 claim.

♦

2,988,496, 6/13/61—ANODE—E. Anderson, assignor to Engelhard Industries, Incorporated, Newark, New Jersey.

Claim 1 reads "An anode comprising a sheet of plastic insulating material and a perforated flat conductive structure of precious metal in surface contact therewith, said structure being mounted between said sheet and a plurality of spaced individual retaining members of a similar insulating plastic material distributed over the area of the precious metal structure at locations away from the edge of the structure and being bonded to the sheet through the perforations in said structure, and means for supplying cathodic protection current to said structure."

4 claims.

♦

2,988,497, 6/13/61—ELECTROPLATING APPARATUS—R. Belke, assignor to Belke Manufacturing Company, Chicago, Illinois.

An electroplating barrel is described.

3 claims, figure.

♦

2,992,945, 6/18/61—RUST REMOVAL—S. Geld, Flushing, L. Miller, Lynbrook, and S. Tudor, Forest Hills, New York.

Rust may be removed from the inner surface of a tank by using a 0.09–0.36 N solution of a mineral acid with a degree of ionization of at least 0.3 for a N-solution at 18C.

17 claims.

TRADE LITERATURE

L—1101. CENTRIFUGAL ENAMELER—A new brochure, describing the recently developed Barrett 100 per cent air-powered centrifugal enameler has been made available by the manufacturer, The Leon J. Barrett Co.

This brochure describes a new development in the application of paint, enamel and other coatings to small parts. Because it is 100 per cent air-powered, it is claimed to safely handle highly volatile coatings. In addition, it provides full control of film thickness of almost any type of coatings.

L—1102. EMULSION CLEANER—A new emulsion cleaner designed to remove hard impacted buffing compounds from all types of basis metals is described in Technical Data Sheet No. 39, a four-page usage and instuction sheet prepared by MacDermid Incorporated.

Called Metex Emulsion Cleaner M-624, the product may be used in concentration as low as five per cent for maximum economy. It is claimed that concentration may be varied to suit conditions, with five per cent giving a normal emulsion and above 20 per cent an invert emulsion.

Because it is designed to emulsify readily, it may be removed easily to prevent contamination of other solutions, according to the manufacturer.

As an accommodation to its readers, PLATING MAGAZINE will be glad to channel to the companies involved, any readers' requests for copies of these latest bulletins and catalogs. Either circle the correct key number on the convenient Reader Service coupon below, or write PLATING MAGAZINE on your letterhead (state correct key number).

Reader Service Department
PLATING MAGAZINE
443-445 Broad Street
Newark 2, N. J.

Please send me information on the items circled.

L-1101	L-1106	L-1111	L-1116
L-1102	L-1107	L-1112	L-1117
L-1103	L-1108	L-1113	L-1118
L-1104	L-1109	L-1114	L-1119
L-1105	L-1110	L-1115	L-1120

—PLEASE PRINT—

Name .....
Title .....
Company .....
Address .....
(Street)
.....
(City) (Zone) (State)

November 1961. Do not use after January 15, 1962

It may be used in steel soak tanks or incorporated in washing machine cycles. Impacted buffing compounds are said to be readily and completely removed from copper without darkening, from zinc or aluminum without etch, from brass without streaking or staining.

L—1103. CENTRIFUGAL PUMPS—Just released is an eight-page brochure on centrifugal pumps designed specifically for corrosive service. The manufacturer, Industrial Filter & Pump Mfg. Co., says these pumps can handle most corrosive solutions from aluminum chloride to zinc sulfate due to a variety of special pump linings compounded and molded in its own plant. Complete performance curves and other technical data are found in this illustrated bulletin, No. 301.

L—1104. WET BLAST EQUIPMENT—A new, six-page, illustrated brochure describing in detail its line of wet blast units is available free from Pressure Blast Manufacturing Company, Inc. In addition to photographs and dimensioned drawings on each of the eight units in the standard Pressure Blast wet blast equipment line.

L—1105. ANODIZING RACKS—New brochure has been made available by Service Rack Division, Servi-Sure Mfg. Co. showing their complete line of racking systems for anodizers and electropolishers. Included are all-titanium pin racks, disc-racks for anodizers, box- and clip-type racking systems and titanium standard racks.

L—1106. ION EXCHANGE—Thirteen case histories of installations using Amberlite 200 cation exchange resin are reported in a technical bulletin published by Rohm & Haas Company. Examples include softening, deionization and special applications in aggressive and oxidative streams and demonstrate the chemical and physical stability of the product under a variety of extreme conditions. This new resin is said to be recommended for use in treating water supplies or industrial wastes that cause standard resins to de-crosslink or fracture.

L—1107. METAL CLEANING—Available from Nox-Rust Division of Daubert Chemical, is a newly-published, 12-page booklet titled "Industrial Metal Cleaning."

The booklet discusses the factors involved in the selection of a cleaner, cleaner equipment and compares the advantages offered by various types of cleaners.

L—1108. DC POWER SUPPLIES—Their "GUIDE" to semiconductor power rectifiers, of which over 6000 have been distributed internationally, has been revised and expanded into two volumes, Industrial and Plating, by The Meaker Co., subsidiary of Sel-Rex Corp.

The 56-page literature describes semiconductor power rectifiers for every ac to dc application, including: anodizing, aircraft ground power supplies, battery chargers, capacitor manufacturing, current limiting, electrochemical processing, electron tube testing, relay testing, shop power supplies, and complete semiconductor power conversion systems for the operation of electrolytic cells.

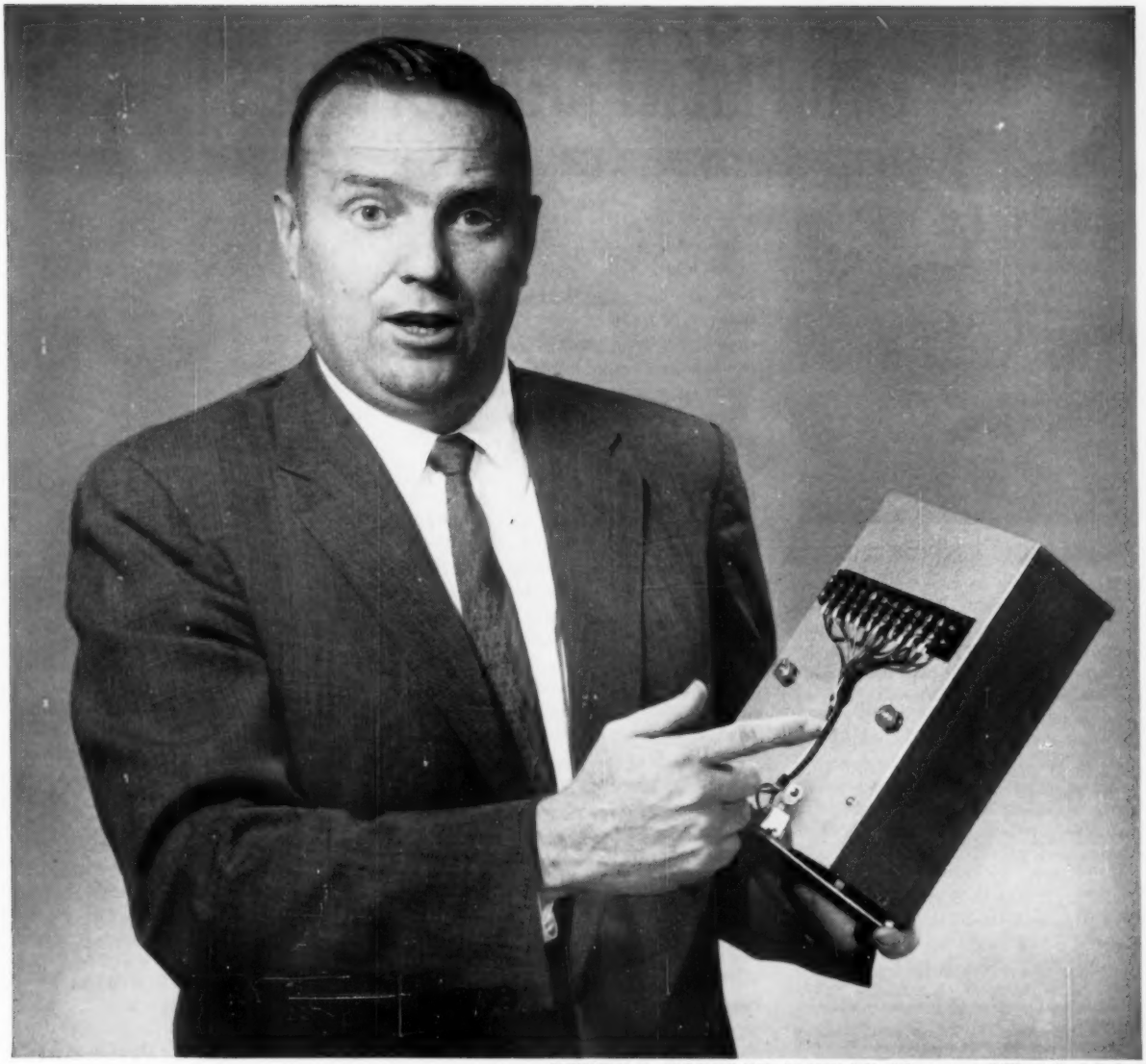
L—1109. PLATING AND PAINTING EQUIPMENT—A new catalog sheet listing the company's complete stock of plating, polishing and spray painting equipment and supplies is being offered free by J. Holland & Sons, Inc.

All items are listed alphabetically in the new literature which represents a handy guide for purchasing.

L—1110. CHEMICAL PLATING—A four-page illustrated brochure describing their new 'Enplate' chemical plating baths has been published by Enthone, Inc. This brochure describes chemical plating baths for depositing nickel, copper, or silver on substrates without electric current. It contains a brief explanation of chemical plating, in addition to introducing the particular features of Enplate Cu-400 copper, Enplate Ni-410 nickel, Enplate Ag-420 silver, and the pre-treatment products of the 'Enplate' process. The brochure lists the specific cycles developed for plating on plastics, ceramics, glass and other non-conductors, in addition to metals and alloys.

L—1111. IMMERSION HEATERS—The newest addition to electric "Therm-X-Red" immersion heaters is announced by New Jersey Thermex Company, Inc. in a new catalog No. SB-10 which explains the salient features of their SB and SSB immersion heaters.

In addition to the technical data, there are photographs and precise illustrations of the heaters and their component parts,



HENRY B. KOEHLER, H-VW-M's Manager of Electrical Sales

Now...in automatic plating rectifiers

A package of good news for platers!

It's the new *control package* from H-VW-M... and here's what it offers you:

Less Downtime, Fewer Rejects. Automatic current limiting is standard, not an extra. Unit won't shut down on normal overloads and shorts.

Grow-Ability. When you need more power in the future, simply connect new units in series or parallel. *No additional controls are needed.*

AVS or ACC. (automatic voltage stabilization, automatic current control)... with current limiting ... are both available at flick of selector switch.

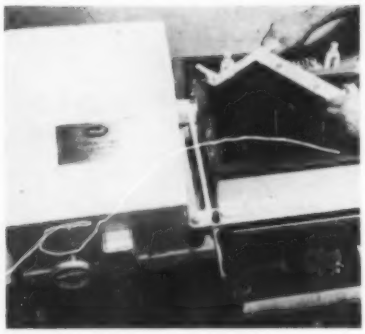
Also yours with this new package control: the advantages of smaller size, less weight, no moving parts. *And the price is hundreds less than you'd pay for the same features in separate rectifier units of conventional design.*

Contact H-VW-M for full details.

H-VW-M *Progress in metalfinishing through advanced processes • equipment*

Hanson-Van Winkle-Munning Company, Matawan, New Jersey • Offices in Principal Cities
Alert Supply Company is H-VW-M in the West • Los Angeles • San Francisco

EQUIPMENT AND SUPPLIES



E—1101. VIBRATING TUBS—Seven finishing jobs can be done simultaneously with new attachments for a vibrating tub produced by Minnesota Mining and Manufacturing Co.

Five side tubs and a divider for the main tub provide seven compartments to finish different parts at the same time in a "Honite" brand Vibrahone finishing machine. The piggy-back units are said to save time, labor and capital investment in finishing small runs of different sized parts. The steel side tubs are lined with rubber to cushion work pieces.

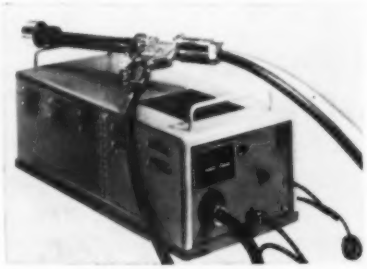
E—1102. CADMIUM BRIGHT DIP—Allied Research Products, Inc. has introduced a liquid bright dip for cadmium, designated as Iridite No. 4L-1.

It is said to be a true single dip which will produce a bright, clear finish on cadmium barrel plated work or rack plated work. Claims state it will stand transfer times of 30 to 40 seconds without cloudiness or staining, and provide excellent corrosion protection, retaining good solderability even after long periods of storage.

E—1103. BUFFING COMPOUND CLEANER—Cowles Chemical Co., has announced the introduction of a new compound for cleaning bar and liquid type buffing compounds from zinc die castings. The product, to be known as Buff-Off, is said to be the most effective and lowest cost buffing compound cleaner available.

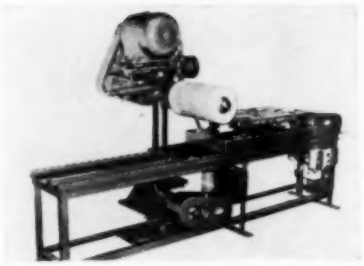
Buff-Off contains no amines. This is said to eliminate the contamination which often interferes with good plating operations. The company claims the product will not streak, etch or darken castings. The problem of "stardust" in the finished plate is eliminated. A five-minute soak with mild agitation is recommended, although three to three and a half minutes is said to prove adequate in some cases. A simple titration determines concentration in a few moments.

E—1104. SPRAY GUN—A new electrostatic hand spray gun said to be capable of coating even intricate shapes with plastic or enamel powders is announced by SAMES.



Called the Stajet,® the equipment consists of an electrostatic generator delivering voltage of 90,000 v and current up to 0.2 ma; a spray gun with an anti-sparking head; and a powder reservoir with vibrator.

In operation, emerging coating particles are electrically charged and then directed to, and evenly deposited on, any object within the influence of the electric field. Since the charged particles are all deposited on the object there is no coating wastage.



E—1105. BUFFING MACHINE—A new automatic reciprocating type straight line buffing machine for buffing and satin finishing surfaces of flat shaped parts is now available from Acme Manufacturing Co.

The machine consists of an oscillating work holding fixture mounted on a reciprocating platen. An Acme G-1 floating head fully adjustable heavy duty buffing lathe performs the finishing operations as the part is reciprocated and oscillated under the buffing wheel. A solenoid-operated timer control permits the work to reciprocate under the wheel for a predetermined time cycle.

E—1106. COMPOUND REMOVER—The Mitchell-Bradford Chemical Co. announces a new product Buf-Comp Remover, a new cleaner designed specifically for removing buffing compounds.

The remover is said to be a combination of the latest developments in liquid detergents and penetrants. It is used 2 to 5 oz/gal of water and operated at a temperature of 160F and, if necessary, to boiling.

E—1107. SPRAY BOOTH COATING—Kelite Corporation announces the development of Paint Guard, a new and improved paint spray booth coating.

It is ready for use without dilution. A non-tacky paste, it is said to be odorless, non-toxic, and non-flammable. It is used whenever paint is sprayed and the overspray accumulates on surfaces from which it subsequently must be removed. This includes walls, floors, and ceilings of paint booths. It is easily applied by brush or spray to form a protective coating of high light reflectance and low specular gloss.

E—1108. ELECTROLESS NICKEL BATH—Enplate Ni-410 chemical nickel plating bath has been developed by Enthone, Inc. It is claimed to deposit a uniformly thick, hard, corrosion resistant nickel plate without the use of electric current.

As an accommodation to its readers, PLATING MAGAZINE will be glad to channel to the companies involved, any readers' request for more complete information on any of these new products. Either circle the corresponding key number on the convenient Reader Service coupon below, or write PLATING MAGAZINE on your letterhead (state correct key number).

Reader Service Department
PLATING MAGAZINE
443-445 Broad Street
Newark 2, N. J.

Please send me information on the items circled.

E-1101	E-1106	E-1111	E-1116
E-1102	E-1107	E-1112	E-1117
E-1103	E-1108	E-1113	E-1118
E-1104	E-1109	E-1114	E-1119
E-1105	E-1110	E-1115	E-1120
E-1121	E-1122	E-1123	E-1124
E-1125			

Name .....
Title .....
Company .....
Address .....
(Street)
.....
(City) (Zone) (State)

November 1961. Do not use after January 15, 1962

Enplate Ni 410 is said to deposit electroless nickel by chemical reduction on aluminum and other metal substrates, in addition to plastics, glass, rubber, and many other non-conductors. It deposits a nickel-phosphorous alloy, more corrosion resistant than electroplated nickel. Claims state it provides 100 per cent throwing power on complex parts. No machining is necessary after plating. Hardness contributes good wear resistance on moving parts.

E—1109. TUMBLING MACHINE—Gray-i-Flo Corporation, announces the PD-10, a new compact tumbling machine. According to the manufacturer, it can be used for cob meal or sawdust drying of metal parts, as well as deburring and burnishing, or cleaning operations. Weighing about 160 lb, the machine has a cylinder capacity of 6 cu ft and is furnished with either ¼ or ½ hp motor drives.

It is of fabricated steel construction with a simple lock pin mechanism allowing three tilting positions, load, unload, and running. Although the cylinder is furnished unlined as standard equipment, neoprene lined cylinders are available.

E—1110. BRIGHT DIP ADDITIVE—Alchemize Additive LS'N is a new product formulated by Alchemize Corporation to reduce processing difficulties inherent in aluminum bright dips. It is said to drastically lessen fuming, drag-out, pitting and streaking. Color and brightness are substantially improved, simultaneously.

The manufacturer states LS'N is suitable for any of the phosphoric acid based dips. Only one per cent by volume, is required and it is claimed to be completely stable at all concentrations and temperatures.

E—1111. BRIGHTENERS—A brightener for cyanide zinc plating designated as Zin-K-Lux-D is said to produce lustrous plate right out of the bath, to have excellent throwing power and is adaptable for both still and barrel plating. It is a product of Kosmos Electro-Finishing Research, Inc.

The firm has also made available Cad-lux-D, a cadmium plating brightener claimed to have maximum throwing power and uniform brilliance; and Ker-Chro-Mite 5 a single step chromate bright dip, for zinc or cadmium. It is supplied in concentrated form and reportedly will produce a lustrous finish in a single dip.

E—1112. ANODES—The availability of platinum-plated titanium anodes—reportedly at a fraction of the cost of solid platinum—has been announced by Technic, Inc.

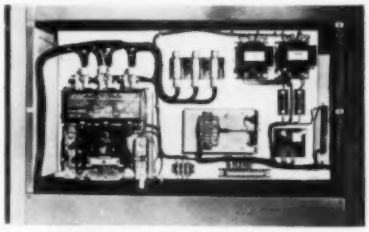
Called Platanodes, the anodes, heavily plated with platinum, may be substituted for solid platinum, in rhodium, acid gold, platinum, palladium, and rhenium plating solutions, according to the developer.

The heavy platinum electroplate is bonded firmly and directly to the titanium base. Standard sizes are 3 in. wide in any length with 1 by 3-1/2-in. tail. Any shape or size is available on special order.

E—1113. POLISHER-GRINDER—After 2½ years of development, the Uni-Pol polisher-grinder is now available for fine lapping and polishing of semi-conductor materials.

The machine incorporates an 80–1200 rpm variable speed control with a powerful semiconductor safeTcircuit ½ hp, d-c motor providing a constant torque at all loads. Vibration and rollout are claimed to be virtually eliminated. The pan, lap, polishing wheel and cover can be changed as one unit in seconds without danger of contamination.

E—1114. AUTOMATIC CONTROL RECTIFIERS—Hanson-Van Winkle-Munning Company announce the availability of a complete new line of automatically controlled silicon rectifiers for high current, low voltage applications such as anodizing and plating, electrochemical uses, and electrochemical machining.



The new line ranges in power from 1000 to 10,000 amp and 6 to 100 v.

The main feature of the new line is a transistorized control package. The package includes a silicon controlled rectifier and provides either automatic current or voltage stabilization.

Depending on applications, control can be made proportional to line speed, temperature, and many other production variables.

E—1115. ZINC BRIGHTENER—A new brightener for zinc barrel lines and automatic barrel plating named "Econobrite", has been developed by R. O. Hull and Company.

Applying new formulation techniques using ROHCO developed ingredients, it is claimed to feature a broader latitude of operating conditions at minimum costs—averaging only 6 to 10 cents per barrel-hour. The manufacture states it is easy to use, and provides greater tolerance for variables—temperature, contamination, concentration, etc.

Luster-on®

THE FIRST AND FINEST IN CONVERSION COATINGS FOR BRASS, ZINC, CADMIUM, COPPER, ALUMINUM

The Chemical Corporation offers a complete line of uniform-controlled chromate conversion coatings that provide maximum protection in one, low-cost, simple operation. Available for immediate delivery as liquids or powders.

always specify luster-on

FOR BRILLIANT CORROSION-RESISTANT FINISHES . . . rivaling chrome for many applications where cost is a factor. Long-lasting, easily controlled application.

FOR CLEAR, BRIGHT and IRIDESCENT COATINGS . . . gives striking, attractive appearance with complete corrosion-protection . . . even when humidity and handling are involved during processing. Also yellow iridescent and olive drab for concealed parts or as a paint bond.

FOR DECORATIVE COLOR . . . on low-cost zinc. Brilliant golds, yellows, blues, greens, violets, reds, brass and copper hues.

FOR ALUMINUM . . . replacing costly anodizing where surface hardness is not of prime importance. Excellent finish for paint bonding. Save 25% or more with Luster-on complete package treatment: cleaners, de-oxidizer, sealer.

FOR LASTING BRIGHTNESS . . . on both copper and brass without noxious fuming.

FOR DIE-CASTINGS . . . one quick dip provides uniform finish, ideal as a base for painting.

We'd like to show you what Luster-on can offer you! Send in sample part today for free processing. Data sheets on request.

BLAKODIZE* . . . chemical black treatment for steel, provides lustrous, rich, black finish with good degree of penetration and rust resistance.

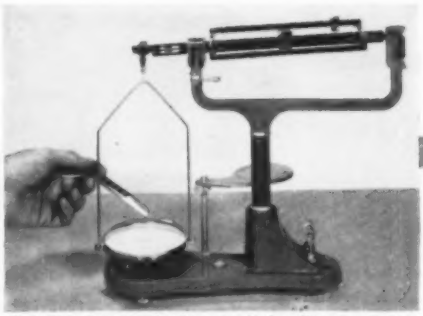
*T.M. Reg.

The Chemical Corporation

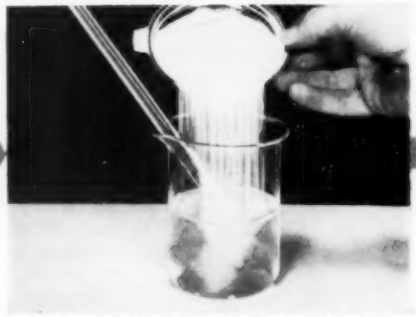
57 Waltham Avenue • Springfield, Mass.

Here's how you can save time, and mixing errors with either

New "Direct-Route" Method



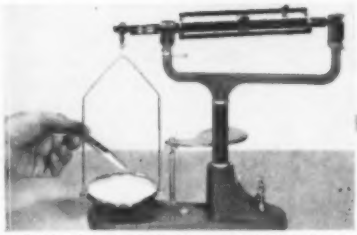
1 Just weigh required amount of sodium-copper or potassium-copper double salt.



2 Dissolve the desired double salt in water or plating solution.

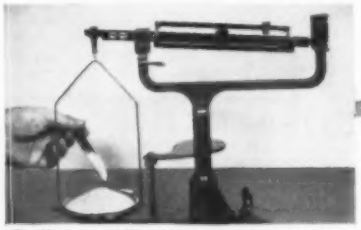
Laboratory demonstration shows how "direct-route" method saves time

Old "Indirect" Method



1 Weigh out required amount of sodium or potassium cyanide.

2 Dissolve the sodium or potassium cyanide in water.



3 Weigh out the required amount of copper cyanide.

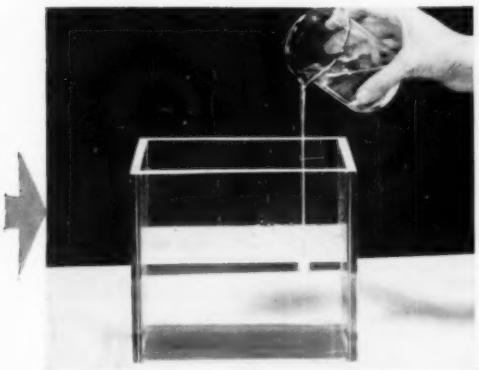
4 Add copper cyanide to water and make a slurry.

5 Dissolve the copper cyanide slurry in solution of sodium or potassium cyanide.

CALL DU PONT FOR ANY ONE OF THESE QUALITY PLATING PRODUCTS. You're assured of superior quality, dependable supply and expert technical service with plating chemicals from Du Pont... your reliable domestic source.

- **Sodium-Copper Cyanide Double Salt**
- **Potassium-Copper Cyanide Double Salt**
- **Copper Cyanide**
- **Potassium Cyanide**
- **All-purpose Cyanobrik® sodium cyanide (in briquette form)**
- **Cyanogran® M sodium cyanide (in granular form)**

reduce handling, avoid waste of Du Pont's Double Salts...



3 Add directly to plating tank—no filtering necessary.

...avoids errors.

6 Add solution through a filter to plating tank.

SODIUM-COPPER CYANIDE OR POTASSIUM-COPPER CYANIDE

SAVE TIME AND REDUCE HANDLING...By using one Du Pont copper cyanide double salt instead of two separate chemicals, you eliminate several steps usually required to dissolve copper cyanide. Just weigh out the Du Pont double salt and dissolve it in water or plating solution. A "direct-route" process! (Compare old and new methods at left.)

AVOID WASTE AND MIXING ERRORS...because active ingredients are in the proportions usually required. This simplifies making and replenishing bath . . . prevents waste resulting from undissolved copper cyanide.

INCREASE CONVENIENCE AND SAFETY...With just one salt to dissolve you minimize handling steps. This means greater convenience—more safety.

Du Pont sodium-copper cyanide double salt and potassium-copper cyanide double salt are white, crystalline and readily soluble. They are made from ingredients of highest quality and purity —Du Pont copper cyanide, sodium cyanide and potassium cyanide.

SIMPLIFY CALCULATIONS...Balanced composition of Du Pont double salts makes it easy to determine amounts required for make-up or replenishment. (1 oz. potassium-copper cyanide double salt is equivalent to 0.26 oz. copper, or 0.37 oz. copper cyanide; 1 oz. sodium-copper cyanide double salt is equivalent to 0.29 oz. copper or 0.41 oz. copper cyanide.)

SODIUM-COPPER CYANIDE DOUBLE SALT

	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	28.7% min.	29%
"Free" sodium cyanide	0.4 to 2.0%	1%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	0.01%

POTASSIUM-COPPER CYANIDE DOUBLE SALT

	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	25.8%	26.3%
"Free" potassium cyanide	1.25% to 3.0%	2.9%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	Trace

Both potassium and sodium double salts are shipped in convenient moisture-resistant 100-lb.-net fiber containers.

For further information or Technical Service call your Du Pont distributor or your nearest Du Pont office, listed at left.

ELECTROCHEMICALS DEPARTMENT • SODIUM PRODUCTS DIVISION
E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DELAWARE

DISTRICT OFFICES:

Atlanta 9, Ga. 1261 Spring St., N.W.
Boston, Mass. 45 Fourth Ave. Waltham 54, Mass.
Charlotte 1, N. C. 427 W. Fourth St.
Chicago 46, Ill. 7250 N. Cicero Ave. Lincolnwood
Cincinnati 2, Ohio 2412 Carew Tower
Cleveland 20, Ohio 11900 Shaker Blvd.
Dallas 21, Texas 8510 Ambassador Row
Detroit 35, Mich. 13000 W. Seven Mile Rd.
Los Angeles, Calif. P. O. Box 70 El Monte, Calif.
New York 1, N. Y. 350 Fifth Ave.
Philadelphia, Pa. 308 E. Lancaster Ave. Wynnewood, Pa.
San Francisco 24, Calif. 1485 Bayshore Blvd.
Export Division Wilmington 98, Del.

Du Pont de Nemours International S. A., Geneva, Switzerland

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E—1116. METAL CONDITIONER—A new improved modification of Chem-Bond, the modern metal conditioner, is now available to platers. Manufactured by the Bell-Ray Chemical Corp. It is claimed to be a major improvement in plating zinc die castings, because under-pickling and over-pickling, which frequently occurs with ordinary acids, are said to be impossible when using it.

It does not represent an additional step. Chem-Bond replaces ordinary acids in plating cycles. Rust, corrosion, tarnishing, and oxidation in general, are prevented or greatly retarded.

E—1117. VIBRATOR—Addition of a 1 cu ft Vibrator finishing model that can be tilted for rinsing while still vibrating has been announced by Lord Chemical & Equipment Division of Wheelabrator Corp. Spokesmen report this feature will allow for a much faster and more thorough rinsing operation. A rinse cover, featuring Lorco's manifold system of spraying the water throughout the work is included with the machine.

Designated the HD-1016 Vibrator, the new model is 10 in. wide, 16 in. long and 13 in. deep, with ½ in. thick rubber lining throughout. The machine contains a variable amplitude shaft, adjustable from 0–¼ in. amplitude. The frequency is variable within a range of 700 to 2100 cycles per minute.

E—1118. TWO-PEN RECORDER—The Esterline-Angus Instrument Company has introduced a new two-pen recorder. The recorder's two pens simultaneously graph on a single chart any information which can be expressed in an electrical current or voltage. Its recording range is from microamperes to thousands of amperes and from microvolts to thousands of volts. It is used to indicate proper settings for anodizing.

E—1119. SPRAY CAP AND TIP—A DeVilbiss air cap and fluid tip for use in connection with the etching or chemical milling of aluminum, aluminum alloys, titanium, stain and tool steels has been announced.

The company recommends its 704 air cap over a FX fluid tip for spray applying Eastman KMER (Kodak Metal Etch Resist) which, when developed, protects the desired areas of the metal from etching during processing.

The cap and tip can be used with standard DeVilbiss guns and a pressure system, either remote cup or tank type.

The thin, transparent, polar film does not interfere with visual inspection or impair the legibility of identifying marks. If discernibility of the film is of importance, a dye can be added.

E—1120. FILTER—A new filter for the electroplating industry is to be marketed under the name Filter-Lyte. It is a cartridge-type filter developed by R. W. Alarie Company, using a specifically engineered product of the American Felt Company.

The core of the new "Filter-Lyte" filter is of perforated high-temperature lucite. It is surrounded by "cogs" of American Felt's Feutron, a specially designed synthetic fiber felt.

The filters are being manufactured in 2 and 5.2 gal/min capacities. The cartridges are available in standard 8 and 4 in. lengths and can be used in any electroplating tank filtering applications where re-cycling filtration is required. The cartridge can be changed in one minute or less with no loss of solution. Unit is self-priming.

The unit is demonstrated and sold nationally by Mahoney Associates.

E—1121. VINYL COATING—A new high build vinyl coating, Amercoat No. 99, has been developed for application with either conventional or airless spray equipment. The new coating is not a mastic, yet it overcomes the application disadvantages of most vinyls, which require multiple coats to achieve minimum protective thickness. As a result, substantial savings are being obtained on material and labor required to provide lasting protection.

No. 99 dries to a hard and tough matte finish which adheres firmly and resists abrasion. Non-flammable, odorless and non-toxic, it will not harbor bacteria or fungi.

E—1122. INFRA-RED HEATING PANELS—Fannon Products Division, Hupp Corporation has introduced a new line of electric quartz infra-red heating panels, elements and engineered oven assemblies for application in process heating.

Fannon quartz infra-red elements are available in 22, 46 and 70 inch overall lengths with wattage ratings from 500 to 1500 w for 115 v elements and 500 to 3500 w for 230 v elements. Special size elements are available upon request. At normal line voltage, Fannon quartz infra-red elements operate at approximately 1600 F, with peak emission at 3–3.5 microns, the far infra-red range readily absorbed by most materials.

E—1123. TREATMENT FOR BUFFS—Yellow flameproof treatment is now available on all cloth bias buffs manufactured by American Buff Co. The new treatment, characterized by a slight yellow coloring, imparts flame protection to all buffs so treated. Buffs cannot ignite even when directly exposed to fire.

The treatment is said to be economical—only slightly higher in cost than an untreated buff. Savings in operation are also achieved, as the treatment extends buff life and provides better compound retention, according to reports.

E—1124. POWDERED PICKLING ACID—A newly-developed powdered acid available from Frederick Gumm Chemical Co. Inc. CLEPO 198-JA is claimed to contain catalysts to provide the additional pickling action necessary to remove the most stubborn scale deposits from ferrous metals. The performance is said to be further enhanced by the inclusion of synthetic detergents in its formulation which suspend light oil residues and prevent them from floating on the acid solution. As a result, oil is not redeposited on clean parts when they are withdrawn from the solution.

E—1125. NEUTRAL GOLD—Orotemp 24, new 24-karat neutral electronic grade gold salts with applications in the electronics field, has been introduced by Technic, Inc.

It is said to produce a stress-free, ultra pure 24 Kt satin bright deposit which is ductile and tight grained and has exceptional heat and corrosion resistance. It is further claimed that the salts contain no brighteners or free cyanide, and the bath is economical to operate and easy to maintain.

"pH PAPERS"

Accurate pH Values in a few seconds right at the tank.

Indicator AND control-colors on SAME strip. Control-colors in steps of 0.2 pH and 0.3 pH.

Plating ranges
(200 strips of a range per box)

Acid:	Alkaline:
6.0–7.4 pH	6.6– 8.0 pH
*4.8–6.2 pH	7.3– 8.7 pH
*3.6–5.0 pH	8.6–10.0 pH
*2.4–3.9 pH	10.1–11.3 pH
1.0–2.8 pH	10.5–13.0 pH
0.4–1.4 pH	11.0–13.1 pH

*Electrometric Values in Nickel Solutions.

Each range is boxed separately.

PAUL FRANK

118 East 28th Street NEW YORK 16

Tel. MU 9-5286

REMEMBER
You Saw It in
PLATING
When Inquiring
or
Use READER SERVICE COUPON

PERSONALS

ROBERT M. BURFORD, OSCAR MAXSTADT and **BERNARD C. VOLTZ** have been appointed to newly-created equipment sales posts in the metal processing department, Pennsalt Chemicals Corp.

Mr. Burford, named supervisor of equipment sales, moves to his new assignment from Cleveland where he was district manager. He joined Pennsalt in 1947 as a metal processing salesman in Erie, and subsequently held district management positions in Buffalo, Pittsburgh and Cleveland. He is a graduate of the University of Pittsburgh and a member of the American Electroplaters' Society and the Metal Finishers Suppliers' Association.

R. M. Burford

O. Maxstadt

Mr. Maxstadt becomes supervisor of design engineering within the equipment group. He joined the firm in 1959, following several years as a chief draftsman and project engineer in the missile and aircraft field. He is a graduate of Ohio Mechanics Institute.

Mr. Voltz, who joined Pennsalt early this year, has been appointed supervisor of installation and inspection within the equipment group. He brings to his new assignment many years' experience in machinery engineering in the metal washing equipment field. He attended the University of Cincinnati.

♦

MARK A. McGINNIS, has been promoted from sales manager to vice president, of the The Singleton Co. Mr. McGinnis has managed sales for Singleton since the firm reorganized in November 1960 when Hull acquired its interest.

In addition to continuing his management of Singleton equipment sales, Mr. McGinnis will be administrative head of his department, directing policy, advertising and expanding distribution.

♦

JOHN J. WILSON has been appointed as the Wyandotte Chemicals Corp., J. B. Ford Division's new district sales manager for its New York territory. For the past five years, he was field sales manager in the Philadelphia District.

JAMES S. HUBBARD, formerly the company's New York manager, transfers to manage Cincinnati operations. He took over the New York post in January 1959, and for five years prior to that, was the Ford Division's Boston district sales manager.

M. A. McGinnis

J. J. Wilson

J. S. Hubbard

E. S. Schmeling

E. S. SCHMELING moves from Cincinnati to fill a district sales manager vacancy in Chicago.

All of these men have advanced from the company's nation-wide field organization to sales management.

♦

JOHN R. STROM, technical director of the Roto-Finish Co., and the Ransohoff Co. has been promoted to vice president. He was made technical director in 1960.

Before joining Roto-Finish in 1958, Mr. Strom was a process engineer for the Brown-Lipe-Chapin Division of General Motors, and for the Eljer Company of Marysville, Ohio. He took his chemical engineering degree at Baldwin-Wallace College in 1951. He is a member of the American Electroplaters' Society.

♦

PAUL B. CORNELL has been named assistant manager of Allied Chemical's Solvay Process Division plant at Moundsville, West Virginia. A graduate of the University of Michigan with a degree in chemical engineering, he joined Solvay's Detroit plant in 1950. He became assistant manager of the Detroit plant in 1957 and two years later was named assistant manager of Solvay's Brunswick, Ga., plant.

♦

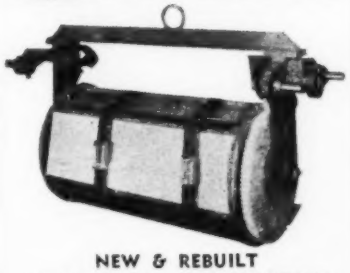
J. W. NOYCE has been appointed by Northwest Chemical Company, Detroit, to serve accounts in the Chicago area. He will work in cooperation with the present staff there. Mr. Noyce is a graduate of Northwestern University and Illinois Institute of Technology.

♦

ROBERT P. JONES, New England division manager of Oakite Products, Inc., since 1954, has been assigned to the New York headquarters of the firm. Mr. Jones, whose experience includes purchasing and accounting as well as sales, will do staff work, reporting directly to the president, John A. Carter.

Mr. Jones joined Oakite in 1949 as a technical service representative in Indianapolis. He is succeeded in his New England post by **ROGER R. HEROUX,** formerly the company's representative in Springfield, Massachusetts.

Clinton



NEW & REBUILT
PLATER'S EQUIPMENT
Complete warehouse stock of PLATING AND POLISHING EQUIPMENT AND SUPPLIES available for immediate delivery
• • • •
METALLIC POWER RECTIFIERS
Write or phone for free catalog
MOnroe 6-7131
Clinton SUPPLY CO.
SINCE 1910
1025 W. JACKSON BLVD. CHICAGO 7, ILL.

WILLIAM A. HOPKINS has been appointed product manager, Plating Division for Metal & Thermit Corp. Mr. Hopkins succeeds Henry Mahlstedt, who will remain in an advisory post.

Mr. Hopkins, who will continue to operate from M&T's Detroit offices, most recently has been assigned special responsibilities for the Metal & Thermit product line of anodes and chemicals for nickel-chromium plating.

Prior to joining M&T at the beginning of this year, Mr. Hopkins was general manager of the Sharonville Division Plant of Electro Auto-Lite Co. near Cincinnati. From 1952 through 1957, he was vice president in charge of sales for Bart Manufacturing Co., Belleville, N. J. Prior to this, he was Michigan district sales manager for McGean Chemical Company.

A native Ohioan, he studied metallurgical engineering at the University of Cincinnati. He is a member of the American Electroplaters' Society.

W. A. Hopkins

S. B. Lonyai

SEYMOUR B. LONYAI has been named general sales manager of Fidelity Chemical Products Corp. In his new post Mr. Lonyai will direct all sales activities, including those of the newly established electronic chemicals division.

Mr. Lonyai began his career with Fidelity Chemical 16 years ago as a technical sales representative. He was a supervisor in the metal finishing department of Bendix Aviation Corp. before joining Fidelity.

Mr. Lonyai is a graduate of the National Agricultural College in Doylestown, Pa. He has done graduate work in metallurgy and chemistry at New York University and Newark College of Engineering. He is a member of the American Electroplaters' Society, the American Society for Metals and the Industrial Management Club.

♦

MICHAEL F. SCHAIBLE succeeded **ROBERT L. FIELDING** as president and chief executive officer of Commercial Filters Corporation following completion on July 19 of a merger with RAD, Inc., a Cincinnati research and development firm. RAD will function in Cincinnati as a division of Commercial Filters, which operates from newly expanded administrative headquarters and plant in Melrose, Mass., and plants in Lebanon, Indiana. Mr. Fielding will serve as vice chairman of the board.

ALFRED F. DUEMLER JR. has been named vice president and treasurer of Commercial Filters. He was associated with RAD, Inc. as vice president following three years as plant manager of the Louisville Brass Plant of American Radiator and Standard Sanitary Corporation.

CARL F. HOLLAND is appointed general sales manager. He was previously sales manager of the Honan-Crane and Delpark product lines of Commercial Filters.

E. JOHN VAN LIER is named chief product engineer. He was formerly engineering supervisor of technical sales for Purolator Products, Inc.; development engineer with Komline & Sanderson Engineering; and project engineer with American Cyanamid Co.

FRED C. VALENTIN is named chief manufacturing engineer. He was manager of manufacturing engineering at Purolator Products, Inc. and was previously with Worcester Pressed Steel and Greer Hydraulics.

CHARLES T. ROSE is appointed chief industrial engineer. He was formerly plant manager with Walker Manufacturing Co., Racine, Wisconsin.

♦

WILLIAM H. BROWN has been appointed by Frederick Gumm Chemical Co., Inc., Kearney, N. J., as technical sales representative in the Philadelphia-Trenton-Camden area, as well as Maryland and Delaware.

Mr. Brown has acquired a wide background in the metal finishing industry as sales engineer for Hanson-Van-Winkle-Munning Co., and previously with Seydel Chemical Co. A veteran of World War II, Brown attended Columbia University, majored in chemical engineering and Rutgers University where he studied sanitary engineering. He is an active member of the Philadelphia Branch of the American Electroplaters' Society. His office will be located at 2536 North Parkview Drive, Norristown, Pa.

W. H. Brown

F. A. Pitschke

FREDERICK A. PITSCHKE has been appointed to the position of sales manager, Electrochemical Machining Division of Hanson-Van Winkle-Munning Company.

Mr. Pitschke, formerly a resident of Rockford, Illinois, has previously been sales manager, electrical discharge machining department of Sundstrand Corporation of Rockford. At the same time he headed the company's numerical control section. He joined Sundstrand in 1947 as a design engineer.

Mr. Pitschke is a University of Wisconsin engineering graduate, class of '47. He attended the University under the US Navy's V12 program. During the Korean War, he served as a 1st Lieutenant in the US Air Force at Wright Field, Dayton, Ohio, in the Wright Air Development Command. In 1959, he was a member of the first graduating class of the Oak Ridge School for Industrial Applications of Radioactive Isotopes.

♦

DR. ALEXANDER ROSS has been appointed European technical representative for M&T Chemicals AG.

Dr. Ross, who will be headquartered in Zug, Switzerland, previously served as supervisor of organic research at Metal & Thermit's research center in Rahway, N. J.

ROBERT FRED HOWARD has been appointed by the Executive Board to fill the vacancy on PLATING MAGAZINE's Editorial Board created by the resignation of Myron B Diggin, vice president, Hanson-Van Winkle-Munning Company, necessitated by recent illness

Mr. Howard attended the University of Kentucky and Union College (Barbourville, Ky.), and has been with the Material and Process Engineering Laboratory, Bell Helicopter Company, Fort Worth, Texas since 1952. Author of a number of articles on aircraft finishes, Mr. Howard is President of AES Dallas-Fort Worth Branch

PATENT ABSTRACTS

(Continued from page 1247)

2,993,266, 7/25/61—CAPACITOR—R. Berry, assignor to Bell Telephone Laboratories, Inc., New York, New York.

Lay down a film of Ta or Cb on a nonconducting substrate by condensation, anodize a portion of the film, then apply an electrically conductive film to the anodized portion.

7 claims, figure.

♦

2,993,272, 7/25/61—COPPER COATED STOCK—P. Crapuchettes, assignor to Litton Industries, Inc., San Carlos, California.

Sheet stock of Mo or W is flashed with Ni in a Cl^- and F^- solution at low *p*H then plated with about 0.002 in. of nickel. Then the composite is heated to 1350C to flow the nickel, and thereafter is formed a continuous conductive bond between a copper coating and the nickel.

4 claims, figure.

♦

2,993,804, 7/25/61—SURFACE TREATMENT—S. Yonezaki, and M. Obu, assignors to Yawata Iron and Steel Company, Ltd., Tokyo, Japan.

A hot dip coated metal having spangles is heated to above the melting point of the coating metal and by a gas flame (600–1000C) at a pressure of 1000–4000 mm of water for 2–60 seconds.

5 claims.

♦

2,993,810, 7/25/61—NICKEL PLATING MAGNESIUM—D. Jensen and L. Nelson, assignors to Douglas Aircraft Company, Santa Monica, California.

A chemical nickel plating process for magnesium is claimed which is free of chloride ions. Fluoride ions must be present and hypophosphite is used to effect the nickel reduction.

13 claims.

♦

2,993,817, 7/25/61—SEMICONDUCTOR JUNCTION—J. Carasso and E. Speight, London, England.

Electroplate an indium body with 0.1–1.0 per cent the thickness of the body with nickel. A disc is cut from the plated indium which is heated to 850C to spheroidize which is then placed on a germanium block and both are heated to 600–850C, then rapidly cooled.

1 claim.

♦

2,993,819, 7/25/61—TREATING ALUMINUM—L. Nessim.

Subject an aluminum coated article to HF gas at 200–400C then contact the AlF_3 coated surface with a solution of a sodium fluoride solution.

5 claims, figure.

♦

2,993,847, 6/25/61—ALUMINUM TREATING PROCESS—J. Poch, assignor to Burroughs Corporation, Detroit, Michigan.

The aluminum object is treated by a low *p*H hexavalent chromium solution to form an electrically conductive coating which is masked off, etched and anodized after which the mask is removed.

1 claim.

MONSANTO TO CONSTRUCT PLANT IN GEORGIA

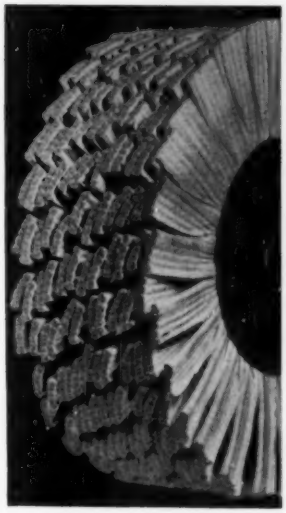
Monsanto Chemical Company's Inorganic Chemicals Division will begin construction early next year of a plant at Augusta, Ga., to produce raw materials for the metal treating and other industries.

The plant, which is scheduled to go on stream early in 1963, will be located on a site of approximately 100 acres five miles south of Augusta's city limits.

Initially, the plant will produce phosphoric acid and sodium tripolyphosphate.

IF YOU WANT

FAST
RUGGED
ACTION
ON YOUR
HEAVY
DUTY
OPERATIONS



YOU WILL SPECIFY

the Churchill 544-RD sisal Finger-Buff*

Improved construction of the sisal type No. 544-RD Churchill Finger-buff* provides new, effective cutting action . . . particularly adapted to perform the heaviest of buffing operations.

Made from the same high quality, super-twisted sisal twine as other popular Churchill sisal wheels, construction of this No. 544-RD provides a wheel in which groups of the sisal twine contained in each finger are combined to form individual units which add strength and rigidity to each finger. In addition, extra sewing on each finger aids in the maintenance of each unit under severe usage.

This new construction greatly increases the life and cutting power of this extra heavy-duty Churchill cord sisal No. 544-RD Finger-Buff.*

• *Churchill Finger-Buffs* are competitively priced, made from sisal or cloth, always bias cut and produced in all sizes from 3" to 21" diameters. For complete information write your problem.*

**The trade's attention is called to United States Patent No. 2,724,937, issued Nov. 29, 1955, to George R. Churchill relating to the cloth-covered cord wheel exclusively manufactured by Geo. R. Churchill Co., Inc. of Hingham, Mass. and marketed under its trade-mark, "Finger-Buffs," Reg. U. S. Pat. Off.*

Geo. R. Churchill Co., INC.
The Original FINGER BUFFS*
(T.M. Reg. U.S. Pat. Off.)
Dept. P-111, Hingham, Mass.
REPRESENTATIVES IN PRINCIPAL CITIES

BRANCH NEWS

Total AES Branches U. S., Canada, Australia, November 1, 1961—61.

ALLENTOWN-READING
Lancy Discusses Waste Disposal

The first regularly scheduled business meeting of the Allentown-Reading Branch was held at Scotty's Anchorage in Emmaus, Pennsylvania on Thursday, September 28.

President **Joseph Hammerl** conducted the business meeting and under his guidance the Branch elected their Delegates and Alternates for the 1961–62 year.

Three applications for membership were approved by the Branch members and discussions were held concerning the AES Achievement Award, and the possible purchase of the "*Introduction to Electroplating*" booklet.

Following the business meeting, Educational chairman **Franklin Welch** introduced guest speaker, Dr. Leslie Lancy of Lancy Laboratories, who spoke on "Waste Disposal and Its Problems." A question-and-answer period followed.

The next meeting will be held October 26, at Menguzzo's Restaurant in Luzerne, Pa.

John B. Ernst
Secretary-Treasurer

BLUE RIDGE
Medford Speaks on Printed Circuits

The first monthly meeting of the 1961–62 fiscal year was held September 8, at the Holliday Inn in Greensboro, North Carolina. Twenty-six members and guests attended. Branch president, **Mike Milo,** called the meeting to order and presided over the business session.

President Milo recognized the seven guests present. He announced the appointment of several committee chairmen. They are: **Howard Welfare, Gerri Lordi** and **Roy Lewis,** Branch District chairmen; **Dave Fineberg,** telephone committee chairman; **Grover Galloway,** sustaining membership chairman; and **George Lefevre,** fellowship chairman.

One new member was elected.

After the business meeting those attending heard **Hugh Medford,** Western Electric Company, speak on "The Manufacture of Printed Circuits."

Donald H. McGee
Secretary-Treasurer

BOSTON
Glover Installs New Members

Boston Branch met Tuesday, June 27, 1961 at the Hotel Statler with President **Hubert H. Foley** in charge. It was voted that the Branch purchase 20 copies of the new 25-year Certificates for presentation at 'New Members' Night' when Boston Branch acts as Host, with the suggestion that it be held in October.

Three applications for membership were approved.

Registration at the Convention was announced as 1178 adults and 75 children.

Manson Glover reported on the business meeting of the Supreme Society, and in particular concerning the proposed detetion of PROCEEDINGS as part of the standard dues requirements.

The following officers were elected: President, **George J. Marotta;** first vice president, **Robert L. Pierce;** second vice president, **Richard S. Murphy;** educational chairman, **Roger R. Roy;** secretary-treasurer, **George P. Swift;** sergeant-at-arms, **James C. George;** board of managers, **Louis J. Love, Andrew W. Garrett,** Hubert H. Foley and **Edmund S. Jevely.**

The officers were installed by Manson Glover with presentation of the speakers' list to the educational chairman, Past President's pin to Hugh Foley and the gavel to George Marotta.

George P. Swift
Secretary

BUFFALO
National Officers Attend; Korbelak Speaker

The Buffalo Branch held its first meeting of the 1961-62 season Friday, September 15, 1961, at our new meeting place The Red Lobster, 2156 Sheridan Drive, Buffalo, N. Y., with 45 members and guests in attendance.

The Branch was honored to have in attendance the officers of the Supreme Society, **Chester G. Borlet,** President; **Manuel Ben,** First Vice President; **Frank O. Beuckman,** Second Vice President; **Edward E. Oberland,** Third Vice President, **Dr. W. Andrew Wesley,** Past President and **John P. Nichols,** National Executive Secretary. **Bert Kirchoff** introduced the National Officers.

President **John Donaldson** introduced the other guests of the evening: **Carl McKetlie, Rene Sonnenfeldt, Tom Kohler, Tony Sojka, Bob Knoble** and **John Killian.**

The following appointments were announced by the President: Christmas Party committee, **Chuck Fotheringham** and **Jack Martin;** technical societies representative, **Matt Hayes;** sick committee, Bert Kirchoff and **Ray Kilroy,** publicity chairman, **John Tiebor.**

Following the business session, Educational Chairman **George Wolf,** introduced the speaker of the evening, **Al Korbelak,** vice president of marketing and new product development of the Sel-Rex Corp. whose topic was "Precious Metal Plating and Solderability."

Special prizes donated by **Mrs. Joan Wiarda** of *Metal Finishing* and Al Korbelak of Sel-Rex Corp. were raffled off at the conclusion of the educational session.

The November meeting will be held Friday, November 3, 1961 at the Red Lobster. The Christmas Party will be held Saturday, December 9, 1961 at the Red Lobster and will take the place of the regular monthly meeting.

Robert C. Eich
Secretary

CHICAGO
Bellinger Talks on Trouble Shooting

The first meeting of the 1961–62 season was held at our new meeting place, the Chemistry Building of Armour Research Foundation of Illinois Institute of Technology at 35th and Dearborn Streets in Chicago. The Housing Committee is to be highly praised for their choice of a site on a campus for future meetings of the Chicago Branch. One application for membership was turned over to the board of managers for approval.

Paul Glab made a plea to the members to send a get-well card or visit **H. A. Gilbertson,** a grand old-timer of our Branch, at Dr. Busch Sanitarium, 170 Hemlock Avenue in Woodale, Illinois. **Rudy Hazucha,** our president, is going to visit him in the very near future.

Bill Geissman, of the Rockford Branch, made an announcement regarding their golf-outing to be held at Freeport, Illinois, on Thursday, September 21, 1961. **Dr. Monaweek** urged members to send their reservations as early as possible for the Midwest Regional Conference to be held on Saturday, October 28, 1961, at Argonne National Laboratory in Lemont, Illinois. Rudy will appoint a committee of five members to make a report at our next meeting regarding the type of festivities for our future annual Ladies Nite. A suggestion was made that members who

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

have been members for 25 years in the Society receive Certificates from the National Society on the annual Ladies Nite.

A motion was passed to support the Chicago Technical Society Council. The Council supports a youth program and a career conference for young students helping to choose a scientific career.

The guest speaker for the evening was **Kenneth Bellinger** of the Conversion Chemical Corporation whose subject was "Trouble Shooting in the Plating Room." His talk was given from the sales engineers point of view and suggested that when on a call, he perhaps can see a problem forming, or before it happens and can make changes so that it will not interfere with production. He must decide whether to do the work there or send the problem back to the company laboratory all depending on the distance from the laboratory. He must be ethical in his line of work and not divulge plating practices as he visits different plants. Each trouble job must be worked out independently. When problems occur such as rejects, lack of uniformity, baths working improperly, etc. try to pick up possible leads by listening to the operator or foreman and avoid any quick solution of trouble. Try to gather all the facts, measure tanks for correct capacity and analyze the solutions. Mr. Bellinger pointed out the problems caused by too cold water in plating, dipping, or rinse tanks; poor housekeeping such as not enough filtration of plating baths, empty anode baskets, dirty anode bars, not removing the slime from the bottom of the rinse tanks, overuse of brighteners especially nickel in cadmium plating baths. A question-and-answer period followed.

Christopher Marzano
Publicity Chairman

CINCINNATI

Buffing and Polishing Discussed by Bergin

The first meeting of 1961–62 on September 27 was called to order by President **Gerry Poli** with 42 members and guests present. Two applications for membership were approved by the Branch. **Dick Evans** gave a final report on the picnic held in August.

The following men were appointed as Delegates and Alternates for the coming year: Delegates: Gerard H. Poll Jr., **David L. Kaplan** and **Edwin Roof**; Alternates: **William B. Stephenson, Edgar Maus and Ezra Blount.**

The topic for the evening was "The Application Techniques of Applying Liquid Buffing and Polishing Compounds," and the speaker was **Frank Bergin** of the Lea Manufacturing Company. After discussing the background in the developments of liquid compounds, the speaker then discussed the many factors which affect the efficient use of these products. The slides which were presented graphically

At Imperial-Eastman Corporation, manufacturer of hydraulic and pneumatic systems components, A. J. Panico, metal cleaning dept. mgr., and D. McCormack, quality control mgr., compare finishing results with R. Dinsmore, Diversey D-Man.

DIVERSEY DS-9 BRIGHT DIP
puts lustrous finishes on stainless steel at less cost!

Every dollar you can cut from finishing costs puts your firm in a better competitive position. Diversey DS-9 not only cuts finishing costs, it improves the appearance of your products with a single immersion. On many parts DS-9 Bright Dip eliminates the need for more costly buffing, electropolishing or grinding. Puts a brilliant finish on hard-to-polish, intricate shape parts yet uses no electric current (another area where you can cut costs). For removing heat treating scale, weld scale, scale from forgings, or simply to provide superior finishing, you'll find Diversey DS-9 Bright Dip gives you the finish you need at a cost you'll appreciate. Also you can now bulk dip and save money.

Call your Diversey D-Man and ask for a trial order of DS-9 Bright Dip concentrate, available at nominal cost.

For complete literature write THE DIVERSEY CORPORATION, 212 W. Monroe St., Chicago 6, Illinois. In Canada: The Diversey Corporation (Canada) Ltd., Clarkson, Ontario

As Mr. McCormack put it:

"My department is interested in quality. DS-9 Bright Dip delivers a better quality finish on stainless steel fittings *and* has substantially reduced reject rates because it completely removes scale."

From the production line Mr. Panico reports:

"Production scheduling used to be a major headache when stainless steel forgings were cleaned outside the shop. Now we have complete production control and we have cut high-cost, in-work inventory."

DIVERSEY.®

TERRIFIC VALUES!
Rebuilt and Guaranteed
PLATING & METAL FINISHING EQUIPMENT
IMMEDIATE SHIPMENT
You name it
We have it.

PLATERS
1—10000/5000 AMPERE, 6/12 V. 40° C. **CHANDEYSSON** Synch.
1—7500/3750 AMPERE, 9/18 VOLT, **H-VW-M**, Synch. 40° C.
1—6000/3000 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS**, Synch.
1—5000/2500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synch.
1—5000/2500 AMP., 9/18 V., 40° C., **CHANDEYSSON**, Synch.
1—5000/2500 AMPERE, 6/12 VOLT, 25° C. **CHANDEYSSON**, Synch.
1—4000/9000 Amp., 12/24 V. **CHANDEYSSON** 40° C. Synch.
1—4000/2000 AMPERE, 6/12 VOLT, **H-VW-M**, Synch.
1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synch.
1—2000/1000 AMPERE, 6/12 VOLT, **H-VW-M**, Synch.

ANODIZERS
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON**, 25° C. and other sizes in stock for immediate delivery; write for details.
2—400 Amp., 40 Volt **MGC**.
1—500 AMP., 24 VOLT **CHANDEYSSON**, Synch. Exc-in-Head.

RECTIFIERS
1—**H-VW-M** Selenium 5000 Amp., 6 V. S.C.F.C. 440/3/60.
2—**H-VW-M** Selenium 3000 Amp., 6 V. S.C.F.C. 440/3/60.
1—**RICHARDSON-ALLEN** Selenium 2500 Amp., 6 V., Remote.
1—**NEW G. E.** 2000/1000 AMPS., 6/12 V. Remote Control 440/3/60 AC.
3—**UDYLITE** No. UV-12 JD Basic, 1500/750 Amp., 12/24 V., Controls Available.
2—**RAPID**—1500 Amp. Periodic reversers.

MISCELLANEOUS
1—**KREIDER** Centrifugal Drier with Heat.
2—R-100 **RONCI** Enamelers.
3—**LASALCO** Ball Burnishers, No. 1, 2 & 4, Lined or Unlined.
1—**HAMMOND** No. VRO-7, 7½ H.P. Variable Speed Buffing Lathes.
10—Buffing Lathes—**HAMMOND, DIVINE, U. S.**, etc., from 3 H.P. to 20 H.P. Single & variable speed.
3—**ACME** Semi-Auto. B/10 Buffing Machines.
2—**AUTOMATIC** Buffing Machines Model 45 Single Spindle.
1—**PRODUCTION** Model A pipe polisher with feed troughs.
3—**PRODUCTION** No. 101 pipe polishers. Individual or in tandem.
1—**HAMMOND** pipe polisher.
1—**STEVEN BADER** Belt Polisher.
1—**ILG** BC-80 Blower Phenolic Coated, V-Belted, 10 H.P. Motor.
1—**AMERICAN** Blower type HS fans. Size 330-10.
8—**DUSKOP** Dust Collector Cabinets. Sizes No. 550, No. 850.
2—Model A **NIEHAUS** fume separators. 1 steel and 1 S. S.
1—**H-VW-M Manning**-Type (Mechanical lift), Full Automatic, Plating Machine 70' long x 4' wide x 36" deep x 10½' overall height.
1—**CROWN** 48 x 36, 2 compartment horizontal tumbling barrel lined.
1—**ACME** L8L Semi-Automatic buffing machine. 8 spindles with 2 7½ HP heads.

M. E. BAKER CO.
Kirkland 7-5460
25 Wheeler St., Cambridge 38, Mass.

illustrated the effects of atomizing pressures, time cycles, positioning of the guns and amount of compound sprayed on the amount of compound which is retained by the buff.

Mr. Bergin pointed out that many buffers could save themselves money and improve their operations if they would only observe their applications intelligently keeping in mind the points which had been brought out by the laboratory tests and indicated by the previous slides.

After a question and answer period the group adjourned to the Social Hour sponsored by the Chipman Supply Co., **Stew Chipman** and **Jack Pfeiffer** as hosts.

David L. Kaplan
Secretary

COLUMBUS

Communication Frontiers Presented by Zweier

The Columbus Branch of the AES held its Annual Banquet at the Grandview Inn on May 6, 1961. The 60 members and their wives that were present were entertained and enlightened by the remarks of the speaker of the evening, **Paul Zweier.** Mr. Zweier, superintendent of development engineering at the Western Electric Works in Columbus, spoke on "New Frontiers in Communication." Frontiers that are being crossed today include push button dialing, home intercom systems, repertory dialing, portable "Bell Boys," and phone booths that are aesthetic dreams.

Frontiers that are pretty certain of being crossed in the next three to five years are the clamp on dial, electronic call transfer, and sequential service. In two years the satellite communication system consisting of 50 satellites 3000 miles in space will be operating. New developments that were frontiers only yesterday include data phones, PBX, automatic billing and timing, Telpak, mail by video and teaching machines. A frontier that is still pretty much way out is a system that would make it possible to contact anybody anyplace overnight. Each baby born would be assigned a number that would be his for life. This system would provide video as well as oral communication.

The telephone companies appear to be giving the world every opportunity to confirm Churchill's statement that "Jaw-jaw is better than war-war."

Mary Fulmer
Secretary

COLUMBUS

Tour Western Electric Plant

The Columbus Branch of the AES met at Western Electric Co., Inc. on September 7, 1961, the president in the chair.

Donald Semones, librarian, announced that meetings this year will all be held the first Thursday of each month at the Desert Inn. A tour of the Western Electric plating facilities was made. These facilities include zinc and nickel-chromium automatic machines; an automatic zinc barrel; horizontal tin and nickel barrels; nickel, copper, chromium, zinc and tin still tanks and nickel and copper, zinc, and tin Daniels barrels.

Mary Fulmer
Secretary

DENVER

Alderuccio Speaker Following Plant Tour

The Denver Branch met September 8 at the Van Waters and Rogers, Inc. building 4300 Holly St. in Denver.

Members and their guests were conducted on a tour of their facilities, followed by a buffet dinner and a short business meeting.

The speaker for the evening was **Lee Alderuccio,** technical service department, Solvay Process Division of Allied Chemical Corp. His subject was Chromium chemicals and Chromium plating on Cast Iron, including the treatment of cast iron before plating.

The group appreciated the efforts of **Duke Quinnell, Walt Smith** and the many others at Van Waters & Rogers for a very interesting and enjoyable evening.

Curt R. Johnson
Secretary

DETROIT

Jackson First Speaker of Golden Anniversary Year

The Detroit Branch held its first meeting of the 1961–1962 season on September 8, at the Statler Hilton Hotel at 8:00 p.m. The speaker was **William H. Jackson,** chief engineer of the barrel department of Udylite Corporation, whose subject was "Barrel Plating Equipment and Processes Involved."

Mr. Jackson was born and educated in England and is now an American citizen. He has been with the Udylite Corporation for 25 years and a member of the Detroit Branch of the AES for 22 years. He has addressed various Branches of the AES across the country for the last 16 years. His talk made special emphasis upon barrel plating equipment.

This opening meeting started the Golden Anniversary year for the Detroit Branch.

The newly elected officers for this season are: President, **Edward Kubis;** first vice president, **John Siefen;** second vice president, **James Douglas Thomas;** secretary-treasurer, **Guy A. Cummings,** Frederic B. Stevens Inc.

William P. Devan
Public Relations Chairman

HAMILTON

Electrostatic Coating Films Shown

The Hamilton Branch opened its new

season with a film night, September 15, at 8:45 p.m.

The meeting was held at the Fischer's Hotel, with President **Bruce Connolly** in the chair. After a short business meeting Mr. Connolly turned the well attended meeting over to **J. B. Needham.**

Mr. Needham introduced the two films which were on the Electrostatic Coating Process. The films were from the Ransburg Electro-Coating Corp., Indianapolis, Indiana.

The first film was on the Ransburg No. 2 Process called "The Big Attraction," the second was "Guided Mist." Both films were well received.

Refreshments were served and the meeting was adjourned at 11 p.m.

Officers for the 1961–1962 season are: President, W. B. Connolly; vice president, J. G. Needham; librarian, **B. C. Teal;** treasurer, **W. Makison;** secretary, **D. J. Darby.**

Donald J. Darby
Secretary

HARTFORD

Cyanide Zinc Plating Discussed by Swalheim

The Branch meeting was held at the Bond Hotel on September 18 and 30 members and guests were present.

The guest speaker for the evening was **Dr. D. A. Swalheim** of the E. I. duPont deNemours & Co. whose subject was "Cyanide Zinc Plating."

Dr. Swalheim stated that the following are some of the reasons for plating zinc from a cyanide bath: 1. Coatings are uniform and rapid coverage is obtained, 2. Low cost protective and decorative coatings, 3. Bath easily controlled and 4. Non-corrosive electrolyte is used. Bath formulation and chemistry were discussed.

Some of the important things covered were: the proper ratio of total cyanide to zinc metal, sodium hydroxide for brightness and bath conductivity, purification or bath purity—maintained by the use of high purity anodes and an excess of sodium polysulfide. The use of organic brighteners was covered and the effect of common contaminants such as copper, cadmium, lead, chromates, oils and greases were shown on Hull Cell test panels by the use of colored slides. Briefly covered were the use and dyeing of conversion coatings.

The technical chairman for the evening was **Ralph McCahan.**

Stanley Platoz
Secretary

INDIANAPOLIS

Ford Plant Tour; Jackson and Whitehurst Speakers

The first meeting of the 1961–62 season, September 5, was called to order by president **Robert Stewart** following the usual dinner at the Construction League. The well-attended meeting started with the usual introduction of members and guests.

Quentin Shockley reported that the arrangements for the Indianapolis Branch to host the Supreme Society Interim Meeting January 13, 1962 were progressing satisfactorily.

Ed Bruck raised the question of inviting the Toledo Branch into the Tri-State organization and discussion revealed that the time for action on this had passed. It was moved by **John Holland** and seconded by Quentin Shockley that Branch Delegates to the 1962 Interim and Milwaukee Convention be appointed by president Robert Stewart. Two new applications for membership received and acknowledged.

Educational Chairman **Richard Watson** introduced **Marshal Whitehurst,** who gave a very interesting talk on how electroless nickel plating had been the answer to some difficult plating requirements at the RCA plant in Indianapolis. This talk was the first of a series of short talks by local Branch members as preludes to the regular guest speakers.

Following an announcement regarding next month's meeting and plant tour of the Ford Motor Company in Indianapolis, Richard Watson, introduced the guest speaker for the evening, **Joe Jackson** of R. O. Hull Company, whose very capable presentation, entitled "Practical Aspects of Zinc and Cadmium Plating," was very interesting and provided us with a better insight into some of the technical as well as practical aspects of the subject. The meeting, both enjoyable and profitable, was rounded out with a lively discussion period.

Les Reynolds
Acting Secretary

ULTRASONIC CLEANING
CUTS REJECTS TO LESS THAN ¼%

A rack of precision reflectors is removed from a side-mounted ultrasonic tank at the Foremost Manufacturing Co.

Mr. Herb Schiller of Foremost Manufacturing Co., Maplewood, N. J., manufacturers of precision metal reflectors states: "Since we installed Branson ultrasonic cleaning equipment our rejects have been reduced from 8% to less than ¼%. Our ultrasonic cleaning equipment is extremely reliable. Branson's excellent service has certainly helped to make our operation even more efficient."

Ultrasonic cleaning achieves a high degree of cleanness far beyond the range of other methods. Although cleanness is still important, there are additional advantages to ultrasonic cleaning. These are:

- Reduced cleaning time
- Cost reduction through labor savings
- Process simplification

Whether your products are small or large, simple or complicated, you owe it to yourself to investigate the use of ultrasonic equipment for your company. Branson's highly experienced, factory-trained specialists stand ready to assist you anywhere in the U. S. Tell us about your particular problem and Branson's engineering department shall try to find the **best** possible solution in the **shortest** possible time.

SINCE 1946 — THE RESPECTED NAME IN ULTRASONICS
BRANSON INSTRUMENTS, INC.
Ultrasonic Power Division
22 Brown House Road, Stamford, Conn.

LANCASTER
Weisberg is Speaker; Ladies Night Planned

The first meeting of the year was called to order by President **George Geesey** following a dinner at the Accomac Inn, York County, Penna. Of the 38 persons present, eight were guests who were introduced by various members.

The resignation of four members was announced, as was the transfer of membership of **James Hildebrand** into the Lancaster Branch from the Philadelphia Branch.

One application for membership was read and turned over to the board of managers for approval.

A short description of the National Convention was given by the Delegates, following which the new Delegates for the forthcoming year were appointed. Those appointed were: **Clester W. Smith, Robert Plaisted** and **Joe H. Shockcor,** with Alternates of **James Lafferty, Curvin Miller** and **John T. Schreck Jr.**

It was announced by **Dr. Martin Frant,** vice president and chairman of Ladies Night, that the annual affair would be held November 11, 1961 at the West Shore Country Club, Camp Hill, Pa., and that the committee was hard at work to produce a gala-evening.

At the completion of the business portion of the meeting, Branch Educational Chairman, John Schreck, introduced the speaker for the evening, **Alfred Weissberg,** vice president, Technic, Inc. Mr. Weisberg gave a talk of the pre-history and early history of electroplating—discussing what scholars have surmised about the use of plating prior to the days of the alchemists. His talk then covered the very early days of plating up until the mid 1800's. The attentive audience was proof of an excellent speech well received.

J. H. Schockcor
Secretary-Treasurer

LOS ANGELES
Membership Drive Launched; Alderuccio Speaker

The Los Angeles Branch held its first fall meeting on Wednesday evening September 13 at the Rodger Young Auditorium.

The meeting was brought to order at 8:00 p.m. by President **Emmett Babcock.** Five guests were introduced by Sergeant-at-Arms **Bob Jones.**

Harvey Hunt announced a new membership drive for the new fiscal year, with the following prizes: 1st Prize, $50.00 Bond; 2nd Prize, $25.00 Bond; 3rd Prize, one year's dues paid in full.

President Babcock gave an abbreviated report on the National Convention and changes in respect to business of the Society.

Gene Bosl introduced the speaker for the evening, **C. L. Alderuccio,** technical service department, Solvay Process Division, Allied Chemical Corp., Syracuse, N. Y. Mr. Alderuccio presented a very informative talk on "The Adhesions of Thick Chromium Deposits as Affected by Surface Preparation." His delivery was supplemented by slides which were very informative. A question-and-answer period followed.

Harold P. Wanamaker
Secretary

MIAMI
Salmonson Talks on Plating Problems; Allen Made Honorary Member

Miami Branch held its first meeting of the 1961–62 season on Thursday, September 28, at the newly decorated and air-conditioned room of the Pan Air Recreational Club, following an excellent buffet.

Charles E. McNally of Donnelly & McNally, local plating consultants, was elected educational chairman, replacing **Anthony Rotoli** now with Oxford Chemical Co. of Atlanta, Ga.

Walter J. Allen, Supreme President in 1923 and now a Miami resident, was elected to Branch Honorary Membership. He is now 88 years old.

Delegates elected were **M. H. Dent, W. Donnelly** and **F. Fulforth,** with Alternates **E. Kennedy, F. Marinello** and **F. B. Salmonson.**

New members and reinstatements have

MODERN METHODS
+
SEELEY BUFFING COMPOUNDS
=
SUPERIOR FINISHES ECONOMICALLY
• • •
Burring—Polishing—Buffing Compounds
Bar—Emulsions
For Satin & High Lustre Metal Finishing
E. E. Seeley Co., Inc. Bridgeport, Conn.

TRUE BRITE
Practical Products

TRUE BRITE Nickel Brightener
the original high performance barrel nickel brightener. Still the standard.

BRASS MAINTENANCE Solutions
the easy way to control of color and performance of brass plating.

OXYPHEN pH Papers
Over 30 ranges to suit all possible solutions and conditions.

SODIUM and POTASSIUM Copper Cyanides
Highest quality soluble salts from our own production for all solutions.

Bulletins available on all products

TRUE BRITE CHEMICAL PRODUCTS CO.
96 Falls Ave. Oakville, Conn.

increased paid members to 40 with nine delinquents, so we hope to soon reach fifty.

Frank Salmonson, general foreman of plating and heat treating at the Florida plant of Pratt & Whitney, gave an excellent practical talk on "Plating Problems" including the necessity and methods for educating recently hired and graduated engineers in practical aspects of plating specifications as well as training of new plating employees, after which he made a complete disclosure of aluminum hard coating by various methods, with practical formulations and procedures for achieving maximum growth and thickness of coating in minimum time for various aluminum alloys.

One method for successfully treating alloys with up to 14 per cent silicon by the use of a pre dip of 70 per cent HNO_3 and 10 per cent HF was of note.

Fred Fulforth
Secretary

MILWAUKEE
Gift of Gab
Brings Recognition

At its first meeting of the 1961–62 season on September 8, the members of the Milwaukee Branch heard **Prof. Lynn Surles** discuss the question of "How Can You Gain Recognition in the Metal Finishing Field?"

Dr. Surles is the author of "Human Relations and Accident Prevention," "The Art of Persuasive Talking," and "The Art of Persuasive Selling." According to him the problem of gaining recognition to a man technically competent in his field is nothing more than a matter of communication. He discussed the many facets of communication by the spoken word including the art of good listening. His talk was entertaining and his suggestions were useful.

President **Arthur Linn** conducted a short business meeting during which the chairmen of the several standing committees were called upon to state their plans for the coming year.

First Vice President **Clinton Host** outlined the plans of the membership committee to obtain new members. Second Vice President **John Auchter** explained the plans of the promotion committee. **Henry Bornitzke** discussed the proposed new directory of members.

Eight new members were inducted.

The membership approved the budget and appropriated funds to operate the Branch during the coming year.

Leslie Diveley
Secretary

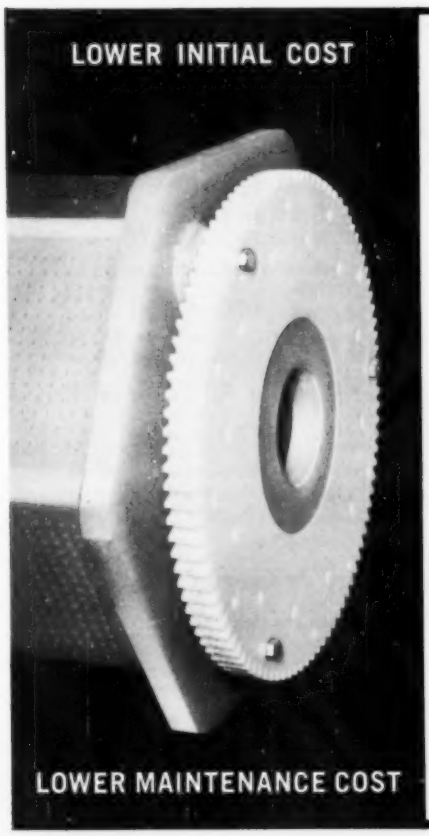
NEWARK
Branch Travels to New York for Regional Meeting

New York Branch President, **Jack Weiner** welcomed about 200 members and guests of both the New York and Newark Branches to the third Metropolitan Regional Meeting. Both Branches were well represented, with the host Branch having a small majority. He then introduced **John Trumbour,** a member of both Branches, and asked him to present the officers of both organizations. Most of the officers were present. However, the host Branch had fewer absentees.

Mr. Trumbour presented **Justin Stremel,** a founding father of the AES. Mr. Stremel is planning retirement in the near future after 62 years service in the plating industry.

Committeemen of both Branches had previously agreed that no business meeting would be held. In lieu of this, Librarian **Walter Schwartz** took over the main activity of the evening. He presented **Jack Kerr,** whose topic was the "Finishing of Aluminum."

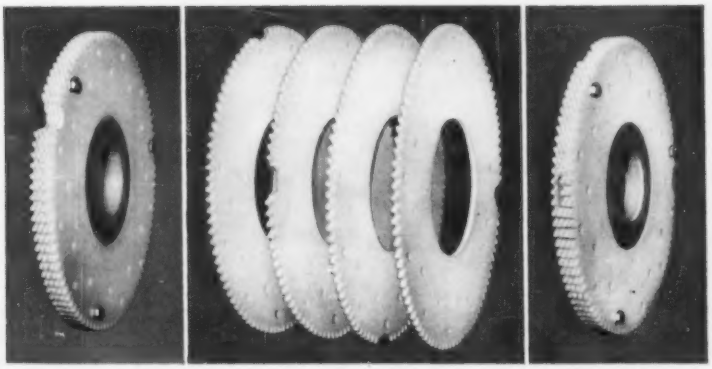
Mr. Kerr made two points clear, 1) aluminum can be finished in more ways than any other metal and, 2) we in the finishing business should have more confidence in ourselves in the finishing of this metal. In this connection, he explained that aluminum is usually anodized or painted, and that we have enough know-how and the proper equipment to do both jobs satisfactorily. He then proceeded to show many of the pitfalls of both types of finishing. Following this he outlined in



* ANOTHER FIRST FROM IMPERIAL!

NEW LAMI-GEAR

WITH UNIQUE QUICK REPAIR FEATURE



If gear teeth break — disassemble and rotate segments — reassemble gear

Standard models in polypropylene. Other materials upon request. Write for full information.

IMPERIAL INDUSTRIES Inc. 36000 EARL STREET WAYNE MICHIGAN

some detail, the necessary control procedures to avoid these troubles. He presented his viewpoint in a very humorous and interesting manner, and made these jobs appear very simple to control.

Mr. Schwartz then presented **John B. Winters** who spoke on "The Anode's Side of the Story." He recognized the fact, that we platers are most interested in the results at the cathode. However, he then proceeded to show how the behavior of the anode can affect what takes place at the cathode.

By the use of slides, he showed what takes place in the plating bath when the current flows, both in theory and in practice. Insufficient anodes or increased plating speeds can cause anode polarization; which in turn unbalances the plating bath in many ways. He concluded his talk by describing in detail specific anode problems in the nickel, tin, cadmium, zinc and chromium baths. Mr. Winters talk was interesting and very enlightening.

After a lively question-and-answer period both speakers were given a rising vote of thanks. The meeting adjourned to partake of coffee, beer, cheese and crackers. This provided a very pleasant moment for members of both Branches to renew old acquaintances.

The New York Branch deserves much credit for their choice of speakers and subjects, and as a fine host.

Gustav Bittrich
Assistant Secretary

NEW YORK
Host to Newark for Regional Meeting

The Third Metropolitan Regional Meeting on September 22 was called to order by President **Jack Weiner** of the New York Branch. There was an excellent turn out from the Newark and New York Branches.

President Weiner called on **John Trumbour** of *Metal Finishing* who introduced the officers of both Branches.

All business was dispensed with and President Weiner turned the meeting over to Librarian **Walter Schwartz** for the educational program. The first speaker was **Jack Kerr,** finishing engineer of Reynolds Metals Co. who spoke on "Finishes for Aluminum." Mr. Kerr said that to get good anodizing there are five steps that must be done with great care. First, you must use the proper alloy for the particular job. Second, good racking to hold pieces securely and allow current to pass. Third, careful cleaning. Fourth, uniform constant temperature in the anodizing bath. Fifth, clean deminarilized water at no less than 206F in the sealing tank. Mr. Kerr also covered the preparation of aluminum for painting. A southerner with a keen sense of humor, he kept his audience wide awake with his stories and theories on obtaining good color matching.

The second speaker of the evening was **John B. Winters,** president and technical director of Incar Inc. and past president of the Cleveland Branch of the AES Mr. Winters talk, "The Anode's Side of The Story," went into electrochemical reactions, electrical and mechanical process of plating operations in relation to the anode. With the aid of slides, Mr. Winters covered the flow of current from the anode to the cathode in lined and unlined tanks. He explained some of the causes of burning on the bottom pieces of racks and remedies for the same. Mr. Winters really gave The Anode's Side of the Story, bringing its importance on the plating cycle to those who think of the anode as just a piece of metal used to conduct current.

After the question-and-answer period both speakers received a standing vote of thanks for two papers presented. The meeting was adjourned and the members retired to partake in foaming refreshment and exchange last summer's experiences.

Fred Saras
Recording Secretary

SPRAY NOZZLES
for Metal Cleaning and Coating
A NEW BULLETIN THAT'S NEWS!
the most complete information ever printed on
SPRAY NOZZLES
for metal cleaning, washing, pickling, rinsing, fogging and coating. Includes spray nozzle reference chart covering every application. For your free copy, just write for Bulletin 106.
SPRAYING SYSTEMS CO.
3227 Randolph Street
Bellwood, Illinois
America's most complete line of spray nozzles

PLATING BARRELS & TANKS

NU-LITE repairs and fabricates specialized component parts for POLYPROPYLENE or LUCITE PORTABLE Plating Barrels—OBLIQUE—HORIZONTAL. We design custom-made hi-speed GOLD Plating Barrels.

Replacement Parts for All Types of Plating Barrels

TANKS can also be made to your specifications to include Air or Mechanical Agitators whether LUCITE—STEEL—WOOD—STAINLESS STEEL. Plastisol Coating And Koroseal Lining.

Prompt Service At Greater Savings

Complete Plating Plants designed and engineered to your specifications.

For your everyday problems or special requirements consult:

NU-LITE PLATING EQUIPMENT CO., INC.
777 Meeker Ave. • STagg 2-3200 • Brooklyn 22, N. Y.

PHILADELPHIA

Brenner Discusses Plating Applications

The first regular meeting of the 1961–62 season was at Beck's Restaurant, September 25 with 44 at dinner and about 70 at the meeting. Guests were introduced by First Vice President **Berenato.**

Dr. Samuel Heiman said his electroplating class at Temple University this season numbered between 35 and 40 students, who would be introduced at the next meeting. The secretary spoke of the passing during the summer of long-time Branch members **Eli J. Rathman** and **Henry W. Long Sr.** and a moment of silence was observed in their memory.

Librarian **Marsh** announced the reintroduction of the Question Box after several years lapse. Three questions in the box were read and answers given from the audience. Mr. Marsh gave a summary of the papers to be heard this season and announced the printed program would be distributed with the October Reminder.

The speaker was **Dr. Abner Brenner,** head of the Electrolysis and Electrodeposition Section, National Bureau of Standards and 1961 AES Scientific Achievement Award recipient, whose topic was "Plating Applications of Recent Interest." Dr. Brenner first discussed the findings of C. J. Thwaites in his paper "The Solderability of Some Tin, Tin Alloy and Other Metallic Coating" (Trans. Inst. Met. Fin. Vol. 36-6, Winter, 1959) and their significance in soldering procedures. He also discussed the characteristics of magnetic coatings on tape and illustrated with slides the effects of variables in a nickel-cobalt bath on the coercive force. In discussing plating on uncommon metals, Dr. Brenner dwelt on the need of protecting refractory metals from oxidation at high temperatures and the difficulties encountered in trying to plate thorium, uranium and other active metals.

Dr. Brenner concluded with gas plating, the deposition of a metal from a gaseous compound of the metal being passed over a heated body. One compound used was tungsten hexafluoride which gave sound deposits with similar characteristics as electrodeposits: nodular, fine grain or laminated. He showed tungsten objects that had been gas formed, very similar to the results obtained by electroforming.

Following Dr. Brenner's interesting and informative talk, the regular business resumed with the reading of the minutes of meetings held since the last regular meeting in May and the treasurer's report. Branch President **Hauseman** introduced **John Lopardo** as the new chairman of the welfare committee. Mr. Berenato announced 25 members with dues unpaid and said they had all been sent letters with a personal follow-up to be made. He read the names of the membership committee and asked that any leads for new members to be given him to turn over to a committee member for action.

Mr. Hauseman announced an Executive Group meeting for October 10 and a short meeting of the Group following the adjournment of the meeting.

I. Wm. Marcovitch
Secretary

PHOENIX

Alderuccio Speaker; New Meeting Place Chosen

The meeting of September 11 was held at Papago Lanes, Scottsdale, Arizona. After a roast beef dinner, **Jim Weaver,** president, opened the meeting. Five guests were welcomed.

First topic of discussion was the Christmas Party. The Party committee is headed by **Floyd Huhn** and was decided that the party was to be held the second Saturday in December.

A lengthy discussion was held concerning a changing of our regular meeting day from Tuesday to Monday due to possibility of speaker's schedule conflict brought on by the formation of the San Diego Branch and setting their meeting for Tuesday night. **Ron Dezember** made the motion that we continue our regular meeting time on the second Tues-

PPI TITANIUM METAL PLATING ACCESSORIES

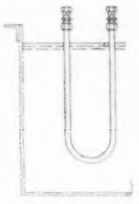
Made of Durable, Lifetime Titanium Metal That Will SAVE YOU TIME and MONEY

For Use in . . . Nickel Plating Solutions

Maintenance Free . . .
• TITANIUM HEATING COILS

Durable-Lifetime . . .
• TITANIUM ANODE HOOKS

Longlasting . . .
• TITANIUM "Scrap-Saver" ANODE BASKETS



HEATING COILS

PAT. PEND.

ANODE HOOK

PAT. PEND.
"Scrap-Saver" ANODE BASKET

WRITE TODAY FOR NEW FREE LITERATURE *Titled,* TITANIUM METAL PLATING ACCESSORIES

PLATING PRODUCTS, Inc.
1509 N. Washington Street, Kokomo, Indiana

Color Buffing Compound 9993 By ARDCO

THE CRAFTSMAN'S CHOICE OF COLORING COMPOUNDS

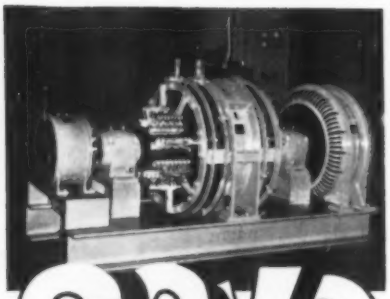
ARDCO's New Coloring Com, pound 9993 enables you to reach a new level of excellence in clean-smooth, smudge-free, reflector bright surfaces when you color-buff non-ferrous metals. Products color buffed with 9993 bear the hallmark of true craftsmanship.

Write today for your free test application sample and for technical information on Compound 9993 and other ARDCO products.

ARDCO

ARDCO INCORPORATED

5000 W. 73rd Street Chicago 38, Illinois
Subsidiary of American Smelting and Refining Company



Save

ON RE-BUILT

CHANDEYSSON

MOTOR

GENERATOR SETS

These motor generator sets have been re-manufactured in the Chandeysson plant by specialists who use the same methods and materials that are used to build new Chandeysson generators. They will provide "like-new" service for 25 years or more, yet cost far less than new generators or rectifiers.

Plating and anodizing motor generator sets with synchronous motor drives and direct connected exciters.

10000/5000 AMPERES, 18/36 VOLTS
7500/3750 AMPERES, 12/24 VOLTS
6000/3000 AMPERES, 8/16 VOLTS
5000/2500 AMPERES, 12/24 VOLTS
5000/2500 AMPERES, 24/48 VOLTS
3000/1500 AMPERES, 6/12 VOLTS
1500/750 AMPERES, 6/12 VOLTS
1000 AMPERES, 100 VOLTS

Other money-saving sets in stock.
For complete information, contact:

PAN
ELECTRIC
HUDSON 1-1400
4060 BINGHAM AVENUE
ST. LOUIS 16, MISSOURI Y61-2

day of the month until such time as it is necessary to make a change. When **Bill Bath,** educational chairman, finds it too difficult to obtain speakers for regular meetings, discussion will be reopened concerning the changing of our meeting date.

The Ron's Club, through the efforts of **John Mullarkey** and Floyd Huhn, has been made available for our meetings during the remainder of the year.

One new membership application was voted and approved by all.

Our speaker for the evening was **Lee Alderuccio** of Allied Chemical Corp. He was accompanied by **Ted Morgan** of the Los Angeles office of Allied Chemical. Mr. Alderuccio gave a very interesting talk concerning "Effect of Smear Layer on Adhesion of Chromium Plate."

Meeting was attended by sixteen memebers and seven guests.

Ron Dezember
Secretary

ROCHESTER
Plating Problems Panel Scheduled For December

The first meeting of the Rochester Branch was started with an excellent Smorgasbord dinner at the Rochester Red Men's Club on Monday, September 11.

After the dinner, the meeting was called to order by President **Charles Fideor** who introduced the guests of the evening. They were: **Rene Sonnenfeldt** and **Tom Kohler** of Sel Rex Corp., **William Flynn** of Turco Products, **Joe Hwalek** of Sargent Greenleaf and **John Moncine.**

Frank O. Beuckman reported on the ASM course in Electroplating that will again be given for interested persons, starting in February. He will explain the course in detail at the October meeting.

Sam D'Angelo, the educational chairman, told about the program of the 1961–62 season. He gave each of the members a list of the speakers and their programs. The December meeting will be a panel discussion of "Problems in the Plating Room." A request of topics to be covered will be mailed to the members, and an appropriate panel of experts will be chosen to answer the questions.

Charles Clark reported on the Christmas party to be held December 15. This will either be preceded by a dinner or followed by a smorgasbord after midnight.

Motion was carried that our meetings for the coming season will be held at the Rochester Red Men's Club on the first Monday of every month with the exception of holidays when it will be held on the second Monday.

Ray Berghold was reported to be seriously ill in the Highland Hospital. (Mr. Berghold succombed to his illness September 22. His passing will be a great loss to the Rochester Branch.)

Peter VanDilst
Secretary

ROCKFORD
Plater's Plae Dae Huge Success

The weather, while threatening, turned out to be ideally cool for the largest Plater's Plae Dae golf outing ever held by the Rockford Branch. Sixty-four members and guests enjoyed the autumn sportiness of a very fine and challenging course at the Freeport Country Club in Freeport, Illinois, with scores ranging from **Fritz Ludolph's** 78 (on a 70 par course) to a dubber's 142. We could not have ordered a better day, or hoped for better attendance, than that which blessed our fine outing on this interesting and finely appointed course.

For the convenience of the golfers—and others—**Nick Servatius** sponsored and tended bar at a refreshment stand at the 15th hole (this may have caused some of the higher scores) as part of the 25th anniversary celebration for Modern Plating Corp. Open house to the AES members and guests had been held in the morning, with kosher corned beef sandwiches and coffee for all who toured the 52,000 square feet of job plating facility in Freeport.

Following a superb buffet dinner in the new clubhouse, prizes for golf and attendance were distributed and the usual orations were heard. **Herman Tessmann,** of the Milwaukee Branch and general chairman of the 1962 Convention to be held in that city, spoke briefly on Convention plans. **Paul Glab,** Chicago Branch and secretary of the Midwest Regional Council, told of the influx of registrations for the Third Technical Seminar to be held at Argonne National Laboratories on October 28. **Rudy Hazucha,** president of the Chicago Branch then announced the change of meeting place for his Branch and invited all to attend their monthly meetings now being held at the Armour Research Institute in Chicago. Lastly, **Tom McCullough,** our educational chairman, announced the programs for the early meetings of the Branch year which hold much promise.

An evening of goodfellowship and congeniality followed and thus ended a fine outing.

Alexander Alexander
Publicity Chairman

SAGINAW VALLEY
Helbig Discusses Activated Carbon

The first regular meeting of Saginaw Valley Branch, was held at Zehnders in Frankenmuth, September 13.

A smorgasbord dinner serving smoked trout, turkey, ham, with all the trimmings, was arranged by **Frank Reha,** president.

Irvin M. Weiss, Regional and National Membership Chairman, spoke briefly on membership problems and congratulated the Saginaw Valley Branch on their new memberships.

W. A. Helbig, Atlas Chemical Company, was the main speaker and spoke on "Activated Carbon, Its Various Uses and Properties."

James Dunn was door prize recipient and the meeting was followed by two movies, "Canoeing in Michigan" and "Caribou Hunting in Canada."

R. M. Peterman
Recording Secretary

SAN DIEGO
Lowenheim Discusses Alloy Plating

The April 11 meeting held at Calabrese's Restaurant, San Diego, was opened by President **Harry Steinke.** Each member and guest introduced himself. **Bill Griff,** past president, Phoenix Branch, was in attendance and spoke on new Branch developments. **George Loch,** vice president and educational chairman commented on forthcoming Educational meeting at Los Angeles Branch. **Claude Weekly,** Los Angeles Branch member, invited San Diego Branch to attend.

Mr. Loch presented **Dr. Frederick A. Lowenheim,** Metal & Thermit Laboratory Manager, who presented a discussion on "Alloy Plating." He spoke of the various alloy baths, controls and problems. The presentation was followed with a spirited question and answer session.

Walter Dornbusch
Secretary

SAN DIEGO
Ultrasonic Cleaning Presented by Sittig

The July 25 meeting at Calabrese's Restaurant, San Diego, was opened by **Harry Steinke,** president. Fourteen members and guests were in attendance.

George Loch, educational chairman, presented **Nick Carter,** Branch member and representative of Ultrasonic Systems, who in turn introduced the speaker for the evening, **Dr. Erhard Sittig,** a member of the research staff at Ultrasonic Systems. Dr. Sittig presented a discussion on ultrasonic cleaning, beginning with the theory of cavitation. The discussion continued with a practical demonstration on the types of transducers used.

Harry Steinke appointed **Lief Nerheim** and **Myron Rogers** as nominating committee to present slate of new officers at September meeting.

Mr. Steinke appointed George Loch and Lief Nerheim as committee to prepare Branch bylaws.

Meeting adjourned at 10:30 p.m.

Walter Dornbusch
Secretary

SAN DIEGO
Alderuccio Speaks on Adhesion of Deposit

The September 12 meeting was held at Calabrese's Restaurant, San Diego, and was called to order at 8:30 p.m. by **Harry Steinke,** president.

George Loch, vice president, presented two candidates for membership. They were accepted by vote of the members.

Harry Steinke appointed **Walt Dornbusch, Dick DeLaCruz** and **Stan Townsend** to study the most appropriate date for the election of officers.

George Loch, educational chairman, presented **Lee Alderuccio,** Solvay Process Division of Allied Chemical Corporation, who presented a talk entitled "Adhesion of Electrodeposits to Basis Metals." Slides implemented his presentation. Test methods were discussed and the problem of "smear layer" in steel under chromium deposits was described. A lively question and answer period followed.

Walter Dornbusch
Secretary

SANTA CLARA VALLEY
Bjelland Talks on Solderability Evaluation

The Santa Clara Valley Branch held its September meeting on Tuesday, the 12th, at the "Old Plantation Restaurant," Los Altos. President **Stanley Bammann** presided. Guests were introduced by Sergeant-at-Arms **Tom Yagi.**

Leo Missel, technical chairman for the evening, introduced the speaker, **Lee K. Bjelland.** Mr. Bjelland, Research Chemist, Convair—Pomona Division of General Dynamics Corporation, presented a very educational talk entitled, "Evaluation of Solderability of Electroplated Coatings."

Educational Chairman **Charles Kuster,** discussed plans for a Ladies Night to be held in January.

John E. Tracy
Secretary

Product: 99.75+% Pure
Service: 100% Sure

Every batch checked. Every can filled with a full weight of extra high quality 99.75+% Chromic Acid. Prompt delivery from ample factory and nearby distributor stocks. Why not order BFC Chromic Acid next time?

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. · 2030 East 15th St., Los Angeles 21, Calif.

SOUTHEASTERN
Parks is Speaker; Dixie Regional Being Planned

The Southeastern Branch held its first meeting of the season at the Pig-N-Whistle Restaurant, Atlanta, September 8, **Jerry LaChappelle** presiding.

Bob Probert announced that the 4th Dixie Regional Technical Session was being put together by a most enthusiastic committee. Ten speakers and a plant tour and more for the ladies were news already promised from the committee. **Pat Millikin** forecast a good return from the printed program and Jerry LaChappelle assures that the meeting will be publicised widely in an effort to achieve a registration goal of 200 people this year. **John Varner** will soon announce speakers.

After dinner John Varner introduced the speaker for the evening, **Dr. Lloyd E. Parks** of the Bee Chemical Company. Dr. Parks sought to tie together the problems of the organic man and the metal plating man, stimulating much interest, and practical discussion.

Three new members were announced.

Robert H. Probert
Assistant Secretary

SOUTHERN TIER
Potter Heads New Slate of Officers

On Tuesday, September 19, the Deep Well Motel, Owego, N. Y., was the scene of the first meeting of the season. After a fine sirloin dinner, the meeting was called by the new president, **William Potter** of Mercury Aircraft, Hammondsport, N. Y. who announced the new officers for 1961-62 season as: Vice President, **Holger Andreasen;** treasurer, **Thomas Holton;** secretary, **John J. Bunsic;** librarian, **Charles Harris.** Outgoing President **William Rossiter** was given a standing vote of thanks for a job well done during the past year. Although no speaker was scheduled much business and many plans were discussed including the coming annual Christmas party. A new member was unanimously elected. President Potter called a board of managers meeting for Oct. 17.

John J. Bunsic
Secretary

SPRINGFIELD
Swift on Metallurgy; Electroplating Courses Forming

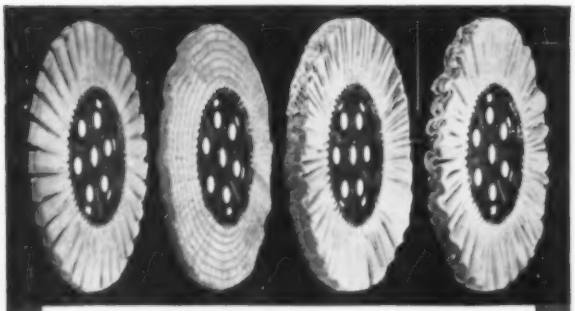
The Springfield Branch opened the 1961-1962 Season with a Special Meeting held at the Wayside Restaurant in West Springfield, on Tuesday evening, September 26. Due to circumstances, this meeting was called on Tuesday, rather than the normal and regular Monday, and will continue on Tuesday, for the balance of the season.

The following were elected as Delegates to the National Convention, in Milwaukee: **Louis E. Dupuis, Robert J. Girard,** and **Harold L. Mitchell.** Alternates are: **John E. Costigan, Henry L. Heissfeld** and **William F. Houlihan Jr.**

A new activities committee was appointed, with **Elery C. Gibson** as chairman and **Ernest P. Donaruma,** as vice chairman. On the committee also, are **Wayne B. Sanders,** Robert J. Girard, **Charles F. Griffin Jr.** and **Alexander R. Salmond.**

Bob Girard announced that registrations are being taken for the Fundamentals of Electroplating Course, and the Engineering for Electroplaters Course, jointly sponsored by the Chicopee Vocational School and the Springfield Branch of the AES. The courses will be presented, on the proviso there will be a minimum of twelve students per course. There is no charge for either class. Mr. Girard is the instructor.

Paul Lane, Branch educational chairman introduced **John A. Swift,** president and technical director of John Swift Chemical Company, Canton, Connecticut. John's background proves he has considerable experience in the manufacture and processing of steel. He graduated MIT with a MS in electrochemical engineering and a BS in metallurgy. He has production experience at Crucible in



FORMAX
CLOTH BUFFS

★ FORMAX BUFFS— These famous fast cutting and long wearing buffs continue to set the standard of performance for bias-type cloth buffs. You can depend on uniform quality from shipment to shipment.

★ High Count, Heavy Duty, Bias-cut Cloth.
★ Extra folds provide wider buff face and greater compound holding capacity.
★ Ventilated Steel Centers.
★ Perfectly balanced sections require no raking.

Write for Descriptive Literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

Formax Buffs manufactured in Canada by:
JOHN GALLOWAY, LTD., KITCHENER, ONTARIO

Well reputable, old established
GERMAN
ELECTROPLATING SUPPLY HOUSE

having a complete production line for electroplating chemicals (inclusive cleaner, buffing compounds, chromating etc.) and all kinds of equipment seeks representation or distributor for chemicals and equipment or/and evaluation of patent rights and know-how in USA and Canada.

Reply Box N1, PLATING
445 Broad St., Newark 2, N. J.

A fast inexpensive way to clean your plating racks

SIMPLE, AIR OPERATED TOOL
Adjustable . prevents rack injury

INGERSOLL RAND

Does not hammer until anvil touches the metal .. then strips the metal in seconds.

$60.00

U.S. INDUSTRIAL TOOL & SUPPLY CO.
8958 GREENFIELD • DETROIT 28, MICH. • BR 3-8318

Syracuse, Western Electric in New Jersey, American Steel and Wire in Worcester, and Billings and Spencer in Hartford, before forming his own company. Mr. Swift spoke on "What the Plater Should Know about the Metallurgy and Manufacture of Steel and How these Factors may affect Plating."

The talk was very interesting and there were a number of favorable comments after the meeting was over. A question-and-answer period followed. Thank you, John, for a very enlightening evening. I speak for a number of members of the Branch, as well as for myself.

Henry L. Heissfeld
Secretary

WATERBURY

Porretti Installed as New President

The first meeting of the Waterbury Branch opened at 8:00 p.m. in the Colonial Room at the Hotel Roger Smith. **William Giesker,** past president, opened the first meeting for 1961-62 season. **Spencer Hen,** installation officer, installed six new officers. They are: **Louis Porretti,** president; **Patric Mazzamaro,** first vice president; **Francis Schneider,** second vice president; **James Kennedy,** secretary-treasurer; **Clance Foster,** Branch educational chairman; **Fred DePalma,** publicity chairman.

The first order of the season was to receive one new member.

James Kennedy read the financial and membership report.

Patric Mazzamaro suggested that at the next meeting, we make our plans and decide on either a Christmas or a Valentine party.

Members and non-members are urged to attend the cocktail and supper-hour, every second Thursday of the month. At 6:30 p.m. we meet in the Cocktail Lounge. At 7:00, in the Colonial room for supper. The meeting and educational session starts at 8:00.

Mr. Foster introduced **William Osgood,** assistant chief of planning, State Highway Division of Connecticut. Mr. Osgood reported on highways now and in the future. According to Mr. Osgood, Connecticut has a bright future ahead for modern highways especially in large cities, where elevated highways are being planned to eliminate congestion. There was a question and answering discussion following his talk.

Refreshments and fellowship were enjoyed.

James Kennedy
Secretary-Treasurer
Fred DePalma
Publicity Chairman

PLATING MAGAZINE invites AES Branches to furnish news for publication in PLATING concerning electroplating courses sponsored.

BRANCH EDUCATION

PHILADELPHIA PLATING CLASS IN 16-WEEK SEMESTER

The fall semester of the Philadelphia Branch sponsored course in electroplating at Temple University Technical Institute, Broad Street and Columbia Avenue, Philadelphia started on September 25. Classes will be held on Monday evenings through January 23, 1962. There are 35 students in this semester's class.

A large part of the present student body is working toward completing the four-semester curriculum in order to receive the Certificate issued by Temple for completing the full two-year course. Some of the students are from such widely distributed points as Harrisburg, Lancaster, Sellersville, Allentown area and Trenton.

Subjects covered this fall will include: chromium, silver, lead, tin, brass and alloy plating; inspection and testing of electrodeposits for thickness, corrosion resistance, adhesion, porosity, etc. Laboratory work will take in analysis and control of the plating solutions, Hull cell testing, and laboratory experiments.

The instructor is Dr. Samuel Heiman of Philadelphia Rust-Proof Co., Inc. Eugene Zurbach of Cleanite Products, Inc. is the laboratory instructor.

ELECTROPLATING COURSES

BROOKLYN, N. Y.—FL Greene Evening High School
Louis Serota, Instructor
18-wk. course—Fee: None

CHICAGO, ILL.—Illinois Institute of Technology
J. M. Andrus, Instructor
18-wk. course—Fee: $80

CLEVELAND, OHIO—Max S. Hayes Trade School
H. Pochapsky Instructor
15-wk. course—Fee: $11

INDIANAPOLIS, IND.—Purdue University Extension
Dr. A. M. Max, Instructor
16-wk. course—Fee: $45

MONTREAL, QUE.—Polytechnique Institute
Dr. Andre Hone, Instructor
3-year course—Fee: $50

NEWARK, N. J.—Plants and Laboratories in Area
F. J. LaManna, Instructor
Climax-Grayway Co., 560 Winters Ave., Paramus, N. J.
14-wk. course—Fee: $25

NEW HAVEN, CONN.—New Haven College
L. J. Durney, Instructor
4-15 wk. Semesters—Fee: $50 per semester
Sept. 1961-Jan. 1962—Electroplating Practice
Feb.-June 1962—Electroplating Fundamentals
Students may enter at any point.

PHILADELPHIA, PA.—Temple University Technical Institute
Dr. S. Heiman, Instructor
4 Semesters, each 16 wks.—Fee: $37 per Sem.

PORTLAND, OREGON—Portland State College
Dr. J. R. Mickelsen, Instructor
10-wk. course —Fee: $10

PROVIDENCE, R. I.—Central Senior High School
Omer Jette, J. Fogarty, J. Castriotta Instructors
2-year course—Fee: None

ROCHESTER, N. Y.—University of Rochester
Frank O. Beuckman
15-wk. course—Fee: $75
Starts February 1962

ST. LOUIS, MO.—Hadley Technical H. S.
Dr. Otto C. Klein, Instructor
16-wk. course—Fee: $10

SAN ANTONIO, TEX.—Trinity University
W. P. Wisdom, Instructor
18-wk. course—Fee: $10

SAN FRANCISCO, CAL.—Cubberly H. S., Palo Alto
William Ferry, Instructor
24-wk. course—Fee: $3 per 12wk semester

SOUTH BEND, IND.
Dr. H. J. Wiesner, Instructor

SPRINGFIELD, MASS.—Chicopee Vocational H. S.
R. J. Girard and E. F. Koetsch Jr., Instructors
Two 12-wk. courses—Fee: None

TORONTO, ONT.—Central Technical High School
R. H. Clark, Instructor
22-wk. course—Fee: $15—non-res.
$ 5—city res.

VANCOUVER, B. C.—Vancouver Technical School
Walter Kellerman, Instructor
6-mo. course—Fee: $15

EVANSVILLE, IND.—Joseph B. Kushner Electroplating School
Joseph B. Kushner, Instructor, 621 S. Norman Ave.
4 mos. to 1 yr. correspondence courses—Fee: $150

SANTE FE SPRINGS, CAL.—Weiner Electroplating School
Milton Weiner, Instructor, 12631 Imperial Highway
3 courses, each 12 weeks—Fee: $40
Practical Electroplating & Metal Finishing, starts Sept. 18, 1961
Theoretical Chemistry & Electrochemistry, starts Jan. 8, 1962
Theoretical & Practical cost & calculations, starts Apr. 2, 1962

The above listings were correct so far as could be ascertained at press time. Prospective students are urged to verify courses and fees prior to making definite plans.

Used or Rebuilt Equipment and Materials for Plating, Metal Finishing and Painting For Sale or Purchase

MART

SPACE RATES
1 time . . . $12.00 per column inch
3 times . . . 11.00 per column inch
6 times . . . 10.00 per column inch
12 times . . . 9.00 per column inch
Per 12 month period dating from first insertion

Clinton

METALLIC POWER RECTIFIERS

PLATER'S EQUIPMENT

Complete warehouse stock of PLATING AND POLISHING EQUIPMENT AND SUPPLIES available for immediate delivery

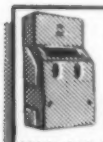
NEW & REBUILT

• • • •

Write or phone for free catalog

MOnroe 6-7131

Clinton SUPPLY CO.
SINCE 1910
1025 W. JACKSON BLVD. CHICAGO 7, ILL.



YOUR One SOURCE For All BLASTING NEEDS
EQUIPMENT
WET-BLAST DRY-BLAST
HYDRA POWER BLAST
AUTOMATION SERVICES, INC.
GRAIN, GRIT, SHOT
P. O. Box 5554 DETROIT 38, MICH.

YOUR PLATING MAGAZINE QUESTIONNAIRE

So as to assure that PLATING MAGAZINE's classification of its subscribers by number, function and geographical location is constantly and consistently up to date for Audit Bureau of Circulations audit, a Return Sheet was, some time ago, issued to each subscriber internationally. If you are among those relatively few who have not yet accomplished and returned yours, your cooperation in doing so promptly will be appreciated by AES and PLATING.

GUARANTEED EQUIPMENT FOR IMMEDIATE DELIVERY

PLATING BARRELS

15—HVWM Melamine, 20" dia. × 30" Dangler Type

2—Twin UDYLITE Tanks and Plating Barrels 14" × 30"

1—UDYLITE Nickel, 14" × 36"

1—Twin PAKERIZING Set Up, gas heated

STORAGE AND PLATING TANKS

Rubber Lined

2—10,000 Gal. 11½' dia. × 15'

1— 7,000 Gal. 16' × 5' × 11' deep

1— 5,000 Gal. 6' dia. × 24'

1— 3,000 Gal. 25' × 4' × 4' deep

1— 3,000 Gal. 25' × 4' × 4' deep Nickel Semi Automatic Plater

1—Koroseal Semi Automatic 22' × 4½' × 4' deep

Stainless Tanks

1—5,000 Gal. 6' dia. × 24'

1—2,700 Gal. 24' × 4½' × 40" deep

2—1,200 Gal. 11' × 3' × 5' deep

1—1,000 Gal. 9' × 3' × 5' deep

1— 900 Gal. 8' × 3' × 5' deep

New Hoist Line Tanks 19'

8—Unlined 3' × 19' × 4' deep

2—Koroseal lined 3' × 19' × 4' deep

1—Unlined 5' × 19' × 4' deep

RELIABLE
INDUSTRIAL EQUIPMENT CO., INC.
633 Richmond St. N.W.
Grand Rapids 4, Mich.
Phone RI 2-2607 or RI 2-3313

GUARANTEED WHEELABRATORS
27 x 36 TUMBLAST—Like New $3000.00
36 x 42 TUMBLAST 2500.00
42 x 48 TUMBLAST 2750.00
Steel Shot & Grit—Save 50%
Trade in your small outmoded *Blast Equipment* on one of the above large *Wheelabrators*.
Terms Available Call Collect Vi 3-6750
DIAMOND SAND BLAST EQUIPMENT CO.
5654 W. Jefferson Detroit 9, Michigan

PRICES OF ELECTROPLATING SUPPLIES

Anodes

CADMIUM, special or patented shapes, per lb	$1.70
COPPER	
Rolled elliptical, 18 inches or longer, 5000 lb lots	44.50
Electrodeposited	37.50
OFHC anodes	42.50
BRASS, 80-20, ball anodes, 2000 lb or more	51.50
ZINC, ball anodes, 2000 lb lots (for elliptical add 1¢ per lb)	18.25
NICKEL, 99 pct plus, rolled carbon 5000 lb (rolled depolarized add 3¢ per lb)	$1.05
TIN, ball anodes, per lb, approximately	$1.26

(Cents per lb, unless otherwise stated, freight allowed in quantity)

Primary Metals

GOLD, U. S. Treas., per oz	$35.00
INDIUM, 99.9 per cent, per troy oz	$2.25
LEAD, New York, cents per lb	11.10
PALLADIUM, per troy oz	$24 to 26
PLATINUM, per troy oz	$82 to $85
RHODIUM, per troy oz	$137 to $140
SILVER, cents per troy oz	91.375

Chemicals

BORIC ACID, 100 lb bag N. Y.	12.10
CADMIUM OXIDE, 100 lb drum per lb	$1.70
CAUSTIC SODA, 100 lb, N. Y.	8.50
CHROMIC ACID, flake type, 100 lb drums	31.00
COPPER CYANIDE, 100 lb drum	65.90
COPPER SULFATE, 100 lb bags, per cwt	15.50
NICKEL CHLORIDE, freight allowed, 100 lb	47.50
NICKEL SULFATE, 5000 lb	31.00
POTASSIUM CYANIDE, 100 lb drum N. Y.	46.50
ROCHELLE SALTS, 100 lb	53.00
SODA ASH, 100 lb	9.10
SODIUM CYANIDE, 2000 lb	25.80
SODIUM STANNATE, 100 to 600 lbs	80.80
ZINC CYANIDE, 100 lb	61.50

(Cents per lb, f o b at point shipped)

Prices in effect October 10, 1961.

These prices, while derived from authentic sources, may be expected to vary by geographic location, quantity purchase, FOB and other terms, market influences and variations. They are presented solely as a general guide.

FUTURE MEETINGS

Education is the business of AES. For National, Regional and Branch educational and other AES meetings ahead, see PLATING's section titled FUTURE MEETINGS herein.

PROFESSIONAL DIRECTORY

Commercial testing and research organizations and individuals offering services of technical nature to the metal finishing industries. Cost: $10 per inch on six time basis; $8 per inch on 12 time basis.

SANDOE LABORATORIES
Chemists—Metallurgists—Engineers
Salt Spray—Thickness Tests—Analyses
Metallography
Research—Development—Testing
209 Rosemary Lane, Philadelphia 19, Pa.
Victor 8-9518

SCIENTIFIC CONTROL LABORATORIES INC.
Finishing Consultants—Registered Prof. Engineers
Control Analyses and Tests, Salt Spray, Thickness
RESEARCH—PLANNING—DEVELOPMENT
Waste Disposal: Research and Control
Telephone: Cliffside 4-2406
3136 South Kolin Avenue Chicago 23, Illinois

SOUTH FLORIDA TEST SERVICE, INC.
TESTING—INSPECTION—RESEARCH
ENGINEERS
Consultants and specialists in corrosion, weathering and sunlight testing.
4301 N.W. 7th St. • Miami 44, Florida

GRAHAM, SAVAGE & ASSOCIATES, INC.
CONSULTING—ENGINEERING—RESEARCH
Electroplating and Metal Processing
Waste Treatment and Production Problems
Surveys—Designs—Specifications
475 York Road, Jenkintown, Pa.
1794 Clinton Street, Kalamazoo, Michigan

THE ANACHEM LABORATORIES
TESTING ANALYSES ENGINEERING
For Metal Finishers
Plating solution analyses and control. Testing of deposit-thickness, composition, porosity, tensile strength. Salt Spray tests.
AIR FORCE CERTIFICATION TESTS
1724 West 58th St. Los Angeles 62, Calif.
AXminster 4-1262

JOSEPH B. KUSHNER, Ph.D.
Metal Finishing Consultant
Training courses for plating personnel
621 S. Norman Avenue, Evansville 14, Ind.
Telephone—GReenleaf 7-4506

WILLIAM E. GRAUL
CONSULTING ENGINEER
Survey, Design, Supervision
Specialists in Plating Room
Installation Engineering
P. O. Box 66 Lansdowne, Pa.

CLASSIFIED ADVERTISEMENTS

Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES Branch Members and Members-at-Large only, in good standing, are entitled (for personal use only) to a total of three free advertisements in any twelve-month period as of first insertion. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

HELP WANTED

SALES MANAGER, Electrochemical, Metallurgical or plating background. Experienced direct mail and customer contact, sales letters, promotion and advertising. Long Island location. Send resume and salary expected. Reply Box N2, PLATING, 445 Broad St., Newark 2, N. J.

SITUATIONS WANTED

PLATING—Challenging assignment in technical service, consulting, development, production. Practical and theoretical experience. Decorative and engineering finishes, specification plating, surveys, complete new plating facilities, trouble shooting, color-dyeing, cost reduction. B.S. in chemistry, 36 yr. old family man. Reply Box N3, PLATING, 445 Broad St., Newark 2, N. J.

AES MEMBERSHIP REPORT

ELECTIONS

Allentown-Reading: R. B. Nealon, G. I. Edson, J. V. Guadagno

Baltimore-Washington: R. A. Taylor

Blue Ridge: A. K. Turton

Bridgeport: C. Nuzzo, F. J. Johnson

Boston: H. G. Sogigian

Central Iowa: M. Langer

Central Michigan: J. H. Foote

Cincinnati: D. T. Jamison, E. W. Greiwe

Detroit: E. L. Abbott, S. F. Czajkowski, R. P. Devane, J. Kovacs, P. W. Nicholson, L. T. Prendergast, P. A. Pulkkinen, T. Silagi, R. J. Wallace, J. F. Wanty

Hamilton: J. R. Little

Hartford: E. R. Roy

Louisville: A. D. Buttorff

Memphis-Midsouth: D. J. Montfort, H. C. Barnes

Miami: C. E. McNally, C. A. DeMeritt, W. J. Allen

Milwaukee: R. Herrmann, E. I. Williams, W. M. Ziegler, G. Court, W. K. Rogers, W. P. McDonough, A. J. Wurster, R. R. Merrill

Santa Clara Valley: J. L. Briggs, G. T. Rooks, J. A. Payne

Sydney: M. McBean, F. H. Barrett, D. J. Bobbin

Toledo: D. A. Fouty

Wichita: B. E. Dawson, C. L. Ziesenis, W. J. Egner, M. E. Meyer, K. Skinner

REINSTATEMENTS

Central Iowa: H. P. Bergen, L. H. Matthews, H. L. Wilkinson

Miami: V. Johnson

TRANSFERS

Cleveland: L. Piovorcy to Memphis-Midsouth

Dallas-Ft. Worth: J. H. Weaver to Dayton

Dayton: J. H. Weaver from Dallas-Ft. Worth

Memphis-Midsouth: L. Piovorcy from Cleveland; W. E. Lydick from Southeastern

Philadelphia: R. T. Richards to Bridgeport

Rochester: P. K. Wiggins to Cincinnati; E. W. Mattheis to Syracuse

San Francisco: W. D. Hart to Santa Clara

Santa Clara Valley: W. D. Hart from San Francisco

Southeastern: W. E. Lydick to Memphis-Midsouth

Sydney: K. Leigh from Melbourne

Member-at-Large: R. J. Rochat

RESIGNATIONS

Allentown-Reading: J. Riegel

Baltimore-Washington: N. E. Promisel

Bridgeport: R. Becker

Buffalo: H. E. Dean, F. D. Goeckel, W. Gruber, G. W. Bishop, H. A. Fudeman

Central Iowa: T. Negro, V. Nus, A. Hiertz

Cincinnati: G. Seymour

Detroit: C. R. Wiese

Memphis-Midsouth: A. E. Bickerstaff, A. D. Carter, D. R. Goodman J. E. Long

Philadelphia: J. T. Moran Jr.

Rochester: R. E. Haller

Sydney: L. A. Smith, E. F. Randell, D. A. Carpenter, R. L. Bennett, J. H. Crombie, J. S. Bridge, T. Kolts

Waterbury: K. J. Jaroc

SUSPENSIONS

Allentown-Reading: H. A. Doty, R. J. Gollatz, Dr. E. J. Serfass

Buffalo: G. B. Beebe, D. G. Black

Central Iowa: V. Balster, H. P. Bergan, J. E. Bridge, L. H. Matthews, M. L. McCullough, H. L. Wilkinson

Chicago: J. J. Buehler, J. Hargraves, D. Russell, E. Stenberg, H. C. Reiling, E. A. Siegfried, J. Lavitas, F. J. LeLuan

Houston: D. W. Lackey, R. A. Marg, H. L. Mauzy, N. Shipp

Los Angeles: G. H. Bishop

Milwaukee: G. Brainard, G. Fridl, W. Hackbarth, P. W. Gross Jr., E. D. Garehime, E. E. Koy, J. G. Miszewski Jr., G. J. Melvin, H. McClellan

New York: M. Bard, C. Benedict, L. Bricker, C. Campion, L. Carnevale, E. DiMascio, I. Dobres, H. Dwoskin, J. Fannon, F. Feldman, S. Ferenz, J. Figli, J. Fowler, D. France, W. Friede, S. Gewertz, J. Goldman, M. Goldwasser, K. Greene, V. C. Harrigan, R. J. Keating, M. D. Noga, C. Paesano, F. Puma, H. Rosenberg, M. Schlüftman, R. Stockslager, W. Venturini, J. C. Weekes, S. Weiner, S. Zimmerman

Rochester: W. C. Helwig, W. A. House

Toledo: C. Ennis, G. Karmel, J. Lee, T. J. Limmex, P. J. Weaver

Wichita: A. L. Baker, M. Edmonston, G. L. Ericson, H. E. Gilmer, R. D. Howard, H. Outsdean, J. W. Rutledge, E. G. Spangler, J. J. Towery

DEATHS

Boston: F. Winsor

Philadelphia: L. J. Rathman

Rochester: R. J. Berghold

Southeastern: C. L. Anger

DERMITRON
NON-DESTRUCTIVE
COATING THICKNESS
TESTER

MEASURES METALLIC AND NON-METALLIC COATING THICKNESS

The DERMITRON **instantly and accurately** provides **direct readings** of metallic and non-metallic coatings and films. It is widely used and recommended for measurement of such coatings as: CADMIUM or ZINC on steel; SILVER on brass; ANODIZING, HARDCOAT, PAINT on aluminum, magnesium, etc.

Very simple to operate, the DERMITRON is compact, offering portability for both laboratory and production use. Four patented measuring probes are available for extra-wide thickness ranges from thick to thin deposits and enable measurements on small areas and previously inaccessible areas. You can rely on the DERMITRON NON-DESTRUCTIVE TESTER for any application where coating thickness must be controlled. **Write for current bulletins and price list.**

PERIODIC-REVERSE
AND CURRENT-INTERRUPTION
UNITS

PERIODIC REVERSE UNITS are used with ALKALINE DERUSTING and DESCALING processes for more efficient and effective cleaning operations. **Write for Bulletin PR-AD-1.**

PERIODIC-REVERSE and CURRENT-INTERRUPTION UNITS—for PLATING of SILVER, COPPER, GOLD, BRASS, etc., this fine electronic equipment saves time, money and improves quality. It makes deposits smoother . . . faster . . . brighter . . . easier to polish . . . less porous . . . more uniform. And it's extremely simple to install and operate. **Write for current Bulletin PR-3 and prices.**

All requests for complete details are processed quickly.

UNIT PROCESS ASSEMBLIES, INC.
53-15 37th Ave., Woodside 77, N. Y.
UPA

FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

November 16, 1961—**Central Iowa Branch Installation Meeting,** Roosevelt Hotel, Cedar Rapids, Iowa.

December 1, 1961—**Melbourne Branch Annual Dinner,** Melbourne, Australia

December 1-2, 1961—**Detroit Branch Annual Educational Meeting and Banquet,** Statler-Hilton Hotel, Detroit, Mich.

December 2, 1961—**Special Meeting, Executive Board, AES,** Statler Hilton Hotel, Detroit, Michigan.

December 9, 1961—**Buffalo Branch, Annual Christmas Party,** Red Lobster, Buffalo, N. Y.

Dec. 15-16, 1961—**Newark Branch Annual Educational Session and Banquet,** Robert Treat Hotel, Newark, N. J.

December 16, 1961—**Bridgeport Branch Dinner-Dance,** Stratfield Hotel, Bridgeport, Conn.

January 11, 1962—**Editorial Board Meeting,** Hotel Marott, Indianapolis, Indiana.

January 11-14, 1962—**Executive Board Meeting,** Hotel Marott, Indianapolis, Indiana.

January 13, 1962—**Ninth Interim Meeting, Supreme Society,** Hotel Marott, Indianapolis, Ind.

January 20, 1962—**Grand Rapids Branch Annual Meeting,** Pantlind Hotel, Grand Rapids, Mich.

January 26, 1962—**Research Committee Meeting,** Conrad Hilton Hotel, Chicago, Ill.

January 27, 1962—**Chicago Branch Annual Educational Meeting and Banquet,** Conrad Hilton Hotel, Chicago, Ill.

February 9-10, 1962—**Fourth Annual Dixie Regional Educational Meeting,** Dinkler-Plaza Hotel, Atlanta, Georgia

February 17, 1962—**New York Branch Annual Technical Session and Banquet,** Hotel Statler-Hilton, New York, N. Y.

March 2-3, 1962—**Philadelphia Branch Annual Educational Session and Banquet,** Benjamin Franklin Hotel, Philadelphia, Pa.

March 3, 1962—**Eighth Annual Tri-State AES Regional Educational Session and Banquet,** Biltmore Hotel, Dayton, Ohio.

April 13-14, 1962—**Executive Board Meeting,** National Headquarters, Newark, N. J.

April 14, 1962—**Baltimore-Washington Branch,** Order of Past Presidents' "Pot" Presentation and Banquet, Baltimore, Maryland (Date Tentative)

April 21, 1962—**23rd Annual New England Regional Meeting,** Hotel Statler, Hartford, Conn., Springfield Branch, Host.

FUTURE MEETINGS

May 1,	1962—**Central Michigan Branch,** Annual Educational Session and Banquet, Hotel Hayes, Jackson, Mich.
June 24-28,	1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.
January 19,	1963—**Tenth Interim Meeting, Supreme Society,** Kansas City, Missouri.
June 24-27,	1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.
June 15-18,	1964—**51st AES Annual Convention,** Sheraton-Jefferson Hotel, St. Louis, Missouri.
June 16-18,	1964—**Sixth Industrial Finishing Exposition,** St. Louis, Missouri.
June 28-July 1,	1965—**52nd AES Annual Convention,** Statler Hotel, New York, N. Y.
June 26-30,	1966—**53rd AES Annual Convention,** Hotel Fontainebleau, Miami, Florida. Dixie Regional Council, Sponsor. Southeastern Branch, Host.
June	1967—**54th AES Annual Convention,** Dallas, Texas

INTERSOCIETY

Nov. 26-Dec. 1,	1961—**American Society of Mechanical Engineers,** Winter Annual Meeting, Statler-HiltonHotel, New York, N. Y.
Nov. 27-Dec. 1,	1961—**28th Exposition of Chemical Industries,** New York Coliseum, New York City.
December 4,	1961—**Institute of Metal Finishing,** Annual Dinner, Hotel Russell, London, England.
Jan. 30-Feb. 2,	1962—**Society of Plastics Engineers,** 18th Annual Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.
February 5-9,	1962—**American Society for Testing Materials,** Committee Week, Statler-Hilton Hotel, Dallas, Texas
March 6-7,	1962—**Society of Vacuum Coaters.** 5th Annual Technical Conference, Sheraton-Cleveland Hotel, Cleveland, Ohio
March 19-23,	1962—**National Association of Corrosion Engineers, 18th Annual Conference, and Corrosion Show,** Kansas City Auditorium, Kansas City, Mo.
May 6-10,	1962—**The Electrochemical Society,** Spring Meeting, Statler-Hilton Hotel, Los Angeles, Calif.
June 24-29,	1962—**American Society for Testing Materials,** Annual Meeting and Apparatus Exhibit, Statler-Hilton Hotel, New York, N. Y.
Sept. 16-20,	1962—**The Electrochemical Society,** Fall Meeting, Hotel Statler-Hilton, Boston, Mass.

AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building
443-445 Broad Street • Newark 2, N. J.
Phone: HUmboldt 2-3400

OFFICERS

President.....CHESTER G. BORLET
Metal & Thermit Corporation
1700 East Nine Mile Rd., Ferndale Station, Detroit 20, Mich.

First Vice President.....MANUEL BEN
Research Laboratories
General Motors Corporation
Twelve Mile and Mound Rds., Warren, Mich.

Second Vice President.....FRANK O. BEUCKMAN
Eastman Kodak Company
Building No. 43, Kodak Park Works
Rochester 4, New York

Third Vice President.....EDWARD E. OBERLAND
Western Electric Co., Inc.
2500 Broening Highway
Baltimore 24, Md.

Past President.....DR. W. ANDREW WESLEY
The International Nickel Company, Inc.
Research Laboratory
P. O. Box U, Bergen Point Station
Bayonne, N. J.

Executive Secretary.....JOHN P. NICHOLS
443–445 Broad St., Newark, N. J.

RESEARCH COMMITTEE

Chairman.....DR. HAROLD J. WIESNER
The Bendix Corporation, Bendix Products Division
South Bend 20, Indiana

Vice Chairman, Research...DR. BURTON B. KNAPP
The International Nickel Co., Inc.
Research Laboratory
P. O. Box U, Bergen Point Station
Bayonne, N. J.

Vice Chairman, Finance.....EDWARD J. KUBIS
Wyandotte Chemicals Corporation
Wyandotte, Michigan

Secretary-Treasurer.....JOHN P. NICHOLS
443–445 Broad Street, Newark 2, N. J.

COMMITTEE LEADERSHIP

Constitution & By-law Revision	Cleveland F. Nixon
Credentials Committee	Joe H. Shockcor
Editorial Board	John P. Nichols
Educational Committee	Ralph H. McCahan
Honorary Membership Award Committee	Herberth E. Head
Law Committee	Manson Glover
Membership Committee	Irvin M. Weiss
Paper Awards Committee	Dr. Martin S. Frant
Proctor Leadership Award Committee	Chester G. Borlet
Publications Committee	Francis T. Eddy
Public Relations Committee	Allen Ferguson
Scientific Achievement Award Committee	Dr. A. K. Graham

ADVERTISING INDEX

This index is published entirely as a convenience. Every care for accuracy has been exercised. No assurance can be given, however, against inadvertent error.

A

Acoustica, General Ultrasonics Div. 1244
Allied Chemical Corp., Solvay Process Division 1179
Allied Research Products, Inc. 1186, 1188
American Buff Co., The 1244
American Metal Climax Inc. 1197
Ardco, Inc. 1265
Automation Services 1270

B

Baker Company, M. E. 1260
Barrett Chemical Products Co., Inc. 1191
Better Finishes & Coatings, Inc. 1267
Branson Ultrasonics Corp. 1261

C

Chandeysson Electric Co. 1178, 1266
Chemical Corporation, The 1251
Clinton Supply Co. 1254, 1270
Churchill Company, Inc., Geo. B. 1257

D

Davies Supply & Mfg. Co. 1237
Diamond Sand Blast Equipment Co. 1270
Diversey Corporation 1259
Du Pont de Nemours & Co., E. I. 1252–1253

E

Enthone, Inc. 1173

F

Florida Development Commission 1187
Formax Manufacturing Corp. 1268
Frank, Paul 1255

G

Gumm Chemical Co., Inc., Frederick 1195

H

Hanson-Van Winkle-Munning Company ..... 1200–1201, 1249, Third Cover
Heatbath Corporation 1189
Harshaw Chemical Co., The 1176
Hull & Company Inc., R. O. 1182

I

Imperial Industries, Inc. 1263

K

Kocour Company 1247

L

Lasalco, Inc. 1190
Lea Manufacturing Company 1205
Lea-Ronal, Inc. 1206

M

Mac Dermid, Inc. ..... Fourth Cover
MART 1270
Meaker Company, Inc. 1181
Mitchell-Bate Co. 1244

N

New Holland Machine Co. 1202
Northwest Chemical Co. 1183
Nu-Lite Plating Equipment Co., Inc. 1264

O

Oakite Products, Inc. 1184

P

Pan Electric 1266
Plating Products, Inc. 1265
Professional Directory 1271

R

Rapid Electric Co. 1194
Raybestos-Manhattan, Inc., Manhattan Rubber Div. 1243
Reliable Industrial Equipment 1270

S

Seeley Company, Inc., E. E. 1262
Sellers Engineering Co. 1174
Sel-Rex Corporation ..... Second Cover
Sethco Manufacturing Co. 1198–1199
Singleton Company, The 1202
Spraying Systems Co. 1264
Stevens, Inc., Frederic B. 1192–1193
Stutz Company, The 1180

T

True Brite Chemical Products Co. 1262

U

Udylite Corporation, The 1239–1240–1241–1242
Unit Process Assemblies, Inc. 1272
U. S. Industrial Tool & Supply Co. 1268

W

Wyandotte Chemical Corp. 1203

Z

Zialite Corporation 1202

"THROWS, LEVELS, BRIGHTENS BETTER than any bright nickel bath we've tried before." Speaking of Levelume 220 are partners MIKE SPANOS and FRANK WROBEL, A&A Plating Co., Detroit, shown with some of their 40 types of work.

20% more production on toughest job shop plating

...at no extra cost

Nothing tests a bath like a job shop—and A&A Plating Co. is one that often takes on "problem" jobs for other platers. Work ranges from marble size to big cash register shells, much of it tough combinations of zinc die casts and steel. And in 9 years of testing, A&A hasn't found a bright nickel bath that's "more profitable or easier to work with than Levelume 220." Some of the benefits that A&A reports:

Easy Maintenance. Levelume requires minimum analytical control. A&A's bath did not require batch purification during its first 13 month's operation.

Buffing Eliminated on some jobs—at savings to $25 per 1000 parts. Same high-quality finish is achieved.

Auxiliary Anodes Eliminated. Levelume takes chrome "better than anything" in recessed areas.

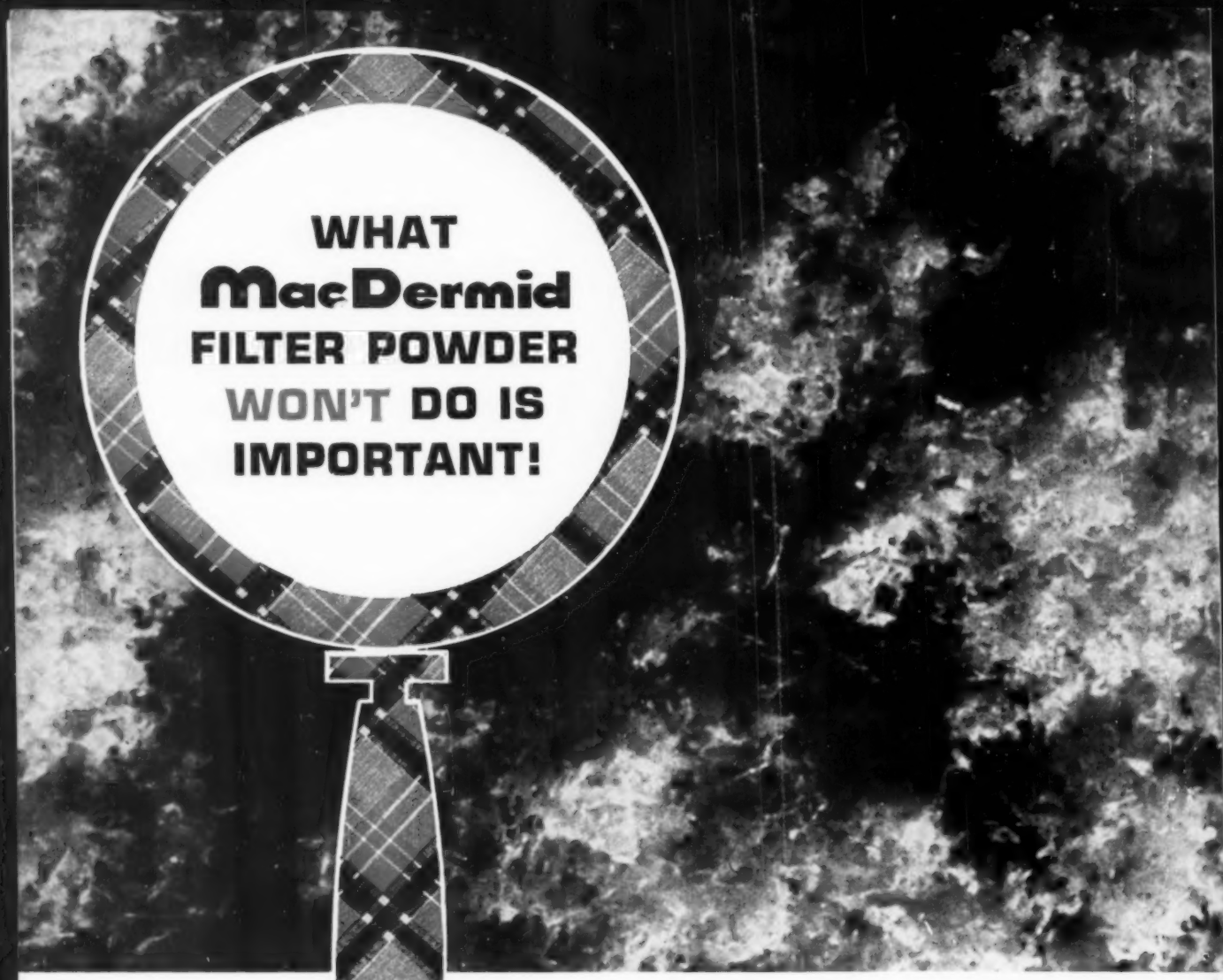
Faster Plating. A&A has stepped up current and gets 20% more production at no increased cost.

What can *your* shop achieve with high-leveling, better-brightening Levelume 220? Contact H-VW-M for technical details.

H-VW-M *Progress in metalfinishing through advanced processes • equipment*

Hanson-Van Winkle-Munning Company, Matawan, New Jersey • Offices in Principal Cities

Alert Supply Company is H-VW-M in the West • Los Angeles • San Francisco

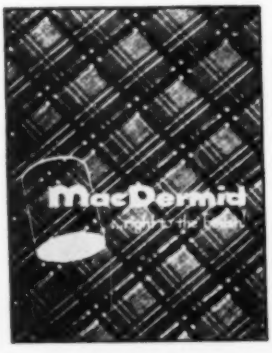


This is an enlarged photo of MacDermid Filter Powder ~ notice the soft, fibrous structure ~ won't dissolve in acid or alkaline plating solutions ~ won't plug or slime over ~ won't drop from filter ~ won't harden or crack filter bags ~ won't settle on work or anodes to cause trouble ~ chemically and electrically inert ~ won't contaminate nickel, copper or other plating solutions ~

MacDermid
INCORPORATED
...right to the Finish!®

WATERBURY, CONNECTICUT
Ferndale, Mich. • Torrance, Calif.

METAL CLEANERS • COPPER PLATING PROCESSES • DRY ACID REPLACEMENT SALTS • MACROMATE CONVERSION COATINGS • ELECTRO AND CHEMICAL POLISHES • BURNISHING AND OTHER METAL FINISHING COMPOUNDS



Send for your FREE copy of our new "Filter Powder Kit" containing complete technical data, helpful tips on filtering and a sample of MacDermid's Filter Powder. And be sure to ask your MacDermid Man to put his "Complete-Cycle" know-how to work cutting costs at every stage in your metal finishing cycle.